METAL INDUSTRY

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# Management and Technology

WHAT is described as the first attempt in this country to relate industrial success to the degree with which individual firms follow the "rules of management" as taught in British technical colleges, is described in a D.S.I.R. booklet published last week under the above title. The research work, on which the subject matter is based, was carried out by the Human Relations Research Unit of the South East Essex Technical College between 1953 and 1957. It has been sponsored by the Joint D.S.I.R.-M.R.C. Human Relations Committee.

The research team found that among the large-batch and mass-production firms there was a relationship between conformity with management theory and business success. Therefore, within this particular range of productive systems, observance of the "rules" does appear to increase administrative efficiency. Outside this group, however, it appears that new "rules" are needed, and it should be recognized that an alternative kind of organizational structure might be more appropriate.

The survey, which was confined to manufacturing firms in South East Essex, actually covered 100 firms employing 100 people or more. In broad terms, it revealed that management organization varies considerably according to the technical demands of the manufacturing process. A breakdown of management into its basic functions—development, production and marketing—showed that the character of the functions, their chronological sequence, the closeness with which they had to be integrated, and their relative importance to the success and survival of the business, all depended on the system of techniques in the firm concerned. They differ mainly, for example, between unit, mass and process production, all of which have different priorities. It is, therefore, possible to trace a "cause and effect" relationship between a system of production and its associated organizational pattern and, as a result, to predict what the organizational requirements are likely to be. The research team also carried out three detailed case studies in firms where production systems were mixed or being changed, and these are described in the report in some detail.

At first sight this report may suggest that management courses have limited usefulness and can, in some circumstances, be misleading to students. The danger lies in the tendency to teach the principles of administration as though they were scientific laws, when they are really little more than administrative expedients found to work well in certain circumstances but never tested in any systematic way. This does not mean, however, that management theory has no value; it contains important and valuable information and ideas, provided its limitations are recognized and its principles subjected to critical analysis. Management studies can so far identify symptoms and remedies. Alleviation of symptoms is useful in itself, but it is only through diagnosis that a physician can either be sure he is prescribing the right treatment or make any useful contribution to existing knowledge of disease. Thus, it is important in alleviating symptoms that physicians do not neglect the problems of diagnosis. In the field of management studies many more descriptive accounts on the lines of those given in the report, of the circumstances in which different administrative expedients have proved successful, are required to supplement traditional teaching.

# *Out of the* MELTING POT

**Joining Forces** LIKE casting, which it supplements, powder metallurgy suffers from a tendency to be exclusive. In the overwhelming majority of cases, a casting is just a casting pure and simple (however complex its design). Whatever other parts, bits and pieces with which it may be assembled in the finished product may be, designers of castings usually prefer to leave the matter of assembly to somebody else, merely condescending to provide a few holes for bolts, studs and the like. Only dire necessity, it seems, will move designers of castings to incorporate a wrought or otherwise prefabricated element as an integral part of their castings. Cases in which such inserts are cast in are still few and far between. Cases in which the "insert" is larger than the cast portion of the finished product are virtually non-existent. A metal sheet with cast-on stiffening ribs, for example, still remains to be seen. With a few exceptions, this same tendency to remain exclusive is also characteristic of parts produced by methods of powder metallurgy. Layers of metal powders are spread over, compacted and sintered on metal strip to form bearing layers, or on stamped sheet metal parts to form friction elements. Another recent case in which the twain did meet was that of cylindrical tantalum powder electrodes for electrolytic condensers, compacted and sintered, spaced out bead-fashion on a length of wire which is afterwards cut between them, leaving the electrodes with convenient contact leads all ready in position. Once this attitude of exclusiveness has been abandoned, many other instances in which production by powder metallurgy could be associated with the incorporation of wrought or cast elements would undoubtedly present themselves to the imagination of designers. One or two sheet metal elements could be slipped into the die prior to the introduction and pressing of the metal powder, subsequently to be ejected and sintered with the compact. The judicious positioning of such inserts may, on occasion, even be found helpful in connection with what would otherwise have been an uncomplacent behaviour of the powder during compacting. And, such metals as uranium and beryllium apart, must the working of powders in metal sheaths always be followed by the removal of the latter? And what, for example, could be the possible uses of slices of consolidated Swiss roll formed from coiled strip with a metal powder as the jam, or of a consolidated coil of insulated wire with the wire as wire and with metal powder, applied during winding, taking the place of the insulation?

**Stale Sensation** IT would, perhaps, have been too much to expect the average reader of metallurgical and metal working literature to have noted the granting, nearly ten years ago, of a number of patents relating to the production of magnesium and magnesium alloy granules, and to the production therefrom of extruded sections. Even if he did notice them, or some reference to them, it would, perhaps, have been expecting too much of him to have taken them seriously: patents are, after all, only patents. It would, perhaps, have been a little less to expect him to have noticed and taken more seriously the much more recent articles describing more particularly the properties of the first such magnesium alloy powder extrusions to have been produced commercially. It would, perhaps, again have been too much to expect him to have been aware that a continuous integrated process has been claimed, comprising production of atomized aluminium powder and its continuous extrusion into a cable sheath. Would it, however, have been too much to have expected some awareness of the above to have shown up in the following item published in September, *1958*?—"Strong, lightweight extrusions are being made from magnesium pellets by a new process that, unlike powder metallurgy, requires no compacting or sintering steps. Method is said to achieve structural shapes with 15 to 40 per cent higher compressive yield strengths than those shaped from billet. A standard extrusion press is used, and 0·016 in. diameter pellets are injected by pneumatic power." A *new* process? No compacting and sintering steps? Is *said* to achieve? Would it now, perhaps, be too much to expect at least some readers to be critical?

**No Face-lifts** SO far as applications of metals and alloys, as well as of any other materials, are concerned, novelty is likely to prove a very fickle factor. Fortunately, in the case of most applications of most metals, novelty is no longer a factor of any importance. Such metals and applications are both of such long standing that they have come to be regarded as naturally belonging together. Not so when novelty comes into the picture. The novelty may, to begin with, appertain to the metal, alloy or other material being used. All applications will then likewise be novel. Because of various advantages attaching to such a situation, it is likely to be kept up well beyond what would otherwise be its normal life span. Any mention of the metal will tend at least to imply that it merits some additional attention or interest because it is new, and that even if the application is not particularly new, some of this special interest in the metal extends and applies to it, and makes it that much out of the ordinary. Finally, there comes a time when the situation becomes untenable. The metal, alloy, or whatever the new material happens to be, can no longer by any artifice be made to appear as new. However, over the years (for the periods of time over which novelty has been kept alive have often been measured in years or even decades) this matter of novelty has usually grown into a habit, and as such is very difficult to get rid of. The result is that long after any suggestion of novelty in relation to the material has become something that would be plainly ridiculous, the habitual need of some mention of novelty is satisfied by implying it in the applications. Admittedly there do occur really novel applications of materials which long ago have lost all trace of novelty. But such applications are few and far between. In their absence, there is the risk that the habit of meeting some degree of novelty associated with the material and/or its applications will ultimately have to be left unsatisfied, with something of an anti-climax and feeling of disillusionment all round. How much better if these had been avoided by a timely refusal to allow an artificially fostered impression of novelty to obscure the natural process of growing up. How pleasant it is to notice that in this respect one of the more novel metals—titanium—is showing signs of success in teaching its grandmothers to suck eggs.

Skimmer

PROPERTIES AND PROCESSING CHARACTERISTICS ABOVE 1,200°C.

# High Temperature Metals

A SYMPOSIUM on the topic "The Study of Metals and Alloys above 1,200°C." was held at the Oxford University Department of Metallurgy on September 17 and 18, each morning and afternoon session being devoted to a study of different aspects of the subject.

**Dr. W. Hume-Rothery,** O.B.E., F.R.S., the first Isaac Wolfson Professor of Metallurgy at Oxford, welcomed the visitors to the symposium in an introductory address, and emphasized the increasing importance of the topic under discussion. He urged that metallurgists should look ahead five or ten years: design engineers were always limited by the high temperature alloys available to them.

The topics discussed at the four sessions are considered in turn below.

### Refractory Metals

The first session was devoted to a study of the properties of some refractory metals and alloys—the platinum metals, tungsten alloys, molybdenum, and titanium-carbon alloys. **Professor E. Raub** (Forschungsinstitut für Edelmetalle und Metallchemie) emphasized the relatively high reactivity with gases and refractory materials possessed by the platinum metals and alloys at high temperatures: volatile oxides are formed with oxygen at temperatures far beyond the existence limit of the normal oxides. Subsequent discussion centred on whether oxygen diffusion can take place through platinum, and it was concluded that it did not diffuse through metal of very high purity, although internal oxidation, for example, has been observed in dilute alloys. Raub next considered the reaction of the platinum metals with refractory materials, and pointed out that a reducing atmosphere at the high temperatures involved led to reduction of the refractories and contamination of the metals. Thus vacuum high frequency melting, or tungsten-arc melting under a very pure argon atmosphere at lowered pressure is best suited to these alloys. Annealing should similarly be done under vacuum or in an atmosphere of purest argon. The main difficulties in the research on these alloys arise from the facts that the temperatures at which transformations in the solid state take place may be very high, and therefore not be observed. On the other hand, segregation or transformation may occur at such low temperature that it is nearly impossible to reach the thermodynamical equilibrium because the mobility of the atoms is too low.

**Dr. R. Kieffer** (Gesellschaft M.B.H., Reutte-Tirol) then introduced a Paper on sintered high-melting tungsten alloys, written in collaboration with K. Sedlatschek and H. Braun. Various methods of preparation of tungsten and tungsten alloys were outlined: sintering under an inert gas or *in vacuo*, or alternatively by melting methods (arc melting, electron bombardment, argon arc and zone melting). Cold ductile tungsten alloys might possibly be made by single crystal formation, vacuum purification or solid solution formation. The alloy systems described were tungsten-molybdenum, tungsten-niobium, and in especial detail tungsten-tantalum. After showing the diffusion process in the system tungsten-tantalum by means of a new metallographic technique, the following properties of sintered tungsten alloys with 0–100 per cent tantalum were outlined; density, hardness, elastic moduli, electrical resistivity, ease of hydrogenation, oxidation behaviour and corrosion resistance in acids and alkalis. Finally the possibilities of working tungsten-tantalum alloys were considered.

**A. R. Moss** (A.R.D.E., Woolwich) next presented a Paper on the factors affecting the grain structure of arc-melted molybdenum ingots, and considered them under the following headings:—

(a) Thermal factors:—heat input and cooling rate; arc length; partition of arc energy; position of arc; rate of solidification; ingot diameter; ingot diameter/ingot length ratio.

(b) Mechanical factors:—vibration; magnetic stirring.

(c) Physical factors:—epitaxy; preferred orientation; supercooling; nucleation; alloys.

Finally, **R. L. Bickerdike** and **G. Hughes** (R.A.E., Farnborough) described a vacuum quenching furnace for use up to about 2,000°C., employing a tantalum heating element. It had been used to examine the titanium-rich end of the titanium-carbon system between 1,558°C. and 1,763°C. A eutectic at 1,645±8°C., and about 1·14 per cent carbon has been found.

### High Temperature Techniques

The session on high temperature techniques opened with two Papers on zone melting. The first, on the zone melting of refractory metals including rhenium and tungsten, by **G. A. Geach** and **F. O. Jones** (A.E.I.) described two techniques. First, an arc melting furnace in which the specimen, supported on a water-cooled copper hearth, is moved slowly under an arc struck from a fixed tungsten electrode, and then a floating zone method using electron bombardment heating to melt a narrow zone of the specimen, which is passed through the heater was also described, and is especially useful for growing single crystals of these metals.

**J. A. Belk** (A.R.D.E., Woolwich) gave further details of the method of electron bombardment, floating zone melting, applied to the removal of carbon from vacuum cast molybdenum. Single crystal rods up to ½ in. diameter have been zoned, and their orientations determined—there being no strongly preferred orientation. The high degree of purity achieved is indicated by the absence of a sharp yield point, and the mechanical properties of the purified material in single crystal and polycrystalline form were summarized.

Arc melting processes were outlined in Papers by **A. R. Moss** (A.R.D.E., Woolwich), **J. R. Murray** and **G. K. Williamson** (A.E.R.E., Harwell) and **F. O. Jones, A. G. Knapton** and **J. Savill** (A.E.I.). Moss discussed the basic principles of the various vacuum-arc and inert-gas arc-melting processes, followed by a consideration of the electrical and mechanical equipment in common use. Mould design and magnetic stirring, and the methods adopted for the making of alloy additions were explained. He surveyed the various operating conditions and the difficulties which may be encountered, both before and during melting.

Miss Murray reviewed the application of arc-melting, and other melting techniques used in alloy investigations at temperatures above 1,200°C. at A.E.R.E., Harwell. Arc melting has been employed in the melting and casting of alloys of refractory metals with maximum economy of materials, also for homogenizing anneals and for determining liquidus temperatures, although serious errors have arisen in some cases. For annealing below 1,400°C. platinum wound furnaces are preferred; uranium alloy filings sealed in silica capsules have been successfully annealed by this method. For higher temperatures a molybdenum spiral vacuum furnace can be used, and in this specimens can be quenched with argon, oil or water. A major difficulty in all these applications is to find a suitable refractory material (ceramic or metallic) to support the highly reactive alloys which have been studied.

Further descriptions of arc furnace techniques were given by Jones, Knapton and Savill, including methods of annealing, quenching, and melting point determinations. They also considered electron bombardment heating as supplementary to arc-furnace techniques, and outlined advantages and disadvantages of the method.

A special molybdenum-wound cooling curve furnace was described by **W. Oldfield** (B.C.I.R.A.), which has a low heat-content molybdenum element completely surrounding the specimen

container. The furnace is then controlled to maintain a constant temperature difference between sample and environment, which, in turn, ensures a constant rate of cooling throughout the arrest.

### Physical Properties

In the session on physical properties and equilibria at high temperatures, **A. J. Martin** and **A. Moore** (A.W.R.E., Aldermaston) discussed the structure of beryllium at temperatures between −185°C. and 1,290°C.—thermal analysis and X-ray diffraction having been employed. No evidence was found to support other workers' claims of allotropy in the temperature range 400°-800°C. Their studies reveal, however, the existence of an allotropic transformation occurring at about 1,250°C. Below this temperature the lattice is hexagonal, as is well known: above it the structure is b.c.c. with a cell size of 2·55 Å. The authors discussed the possibilities of retaining the b.c.c. form at temperatures below 1,250°C.

The Metallurgy Department, R.A.E., Farnborough, then presented a Paper on the properties of deposited carbon. The structures of graphites deposited from hydrocarbon gases at various temperatures and pressures were discussed, and the effect of changes in deposition temperature on the density and X-ray diffraction pattern was shown. Electron micrographs of polished and etched surfaces were also given, and the effect of deforming these graphites was illustrated. The so-called "flecks" produced have a structure not unlike deformation twins.

Two Papers followed by members of the Oxford University Department of Metallurgy, concerned with high temperature equilibria. **C. W. Haworth** described tungsten resistor furnaces in which specimens weighing 1-5 gm. can be annealed *in vacuo* or in an argon atmosphere at temperatures up to 2,700°C. and then quenched into a copper mould or silicone oil—the temperature being measured using an optical pyrometer sighted on a small hole in the lid. The apparatus has been in use for over two years in work on molybdenum-base alloys, including the determination of the solidus and liquidus curves.

Attention was drawn by **A. Hellawell** to the transition from f.c.c. to b.c.c. structures found in the metals of the first three transition series and apparatus was described which has been used in the thermal analysis of these phase transitions. He discussed the results for the two series (manganese and iron) of binary alloys with the rest of the first transition series scandium-copper, and second transition series yttrium-silver. The influence of the various solute elements upon the f.c.c./b.c.c. transition in manganese and iron was shown to be related to the structures of the elements concerned.

The last Paper of the session, by **P. Gross, D. L. Levi** and **G. Wilson** (Fulmer Research Institute) discussed methods for determining the thermodynamic activities of alloy constituents at high temperatures. Two methods for measuring vapour or reaction pressures have been used:

(i) An effusion method (restricted to systems in which the pressure of any constituent does not exceed about 0·1 mm. mercury) applied to alloys containing iron, aluminium and minor constituents of not too high volatility at 1,300°C. To determine the small amount of aluminium effusing, the vapour is adsorbed in a molybdenum funnel, carrying a lid of nickel or platinum. The aluminium content was determined spectrographically after solution of the funnel and lid.

(ii) Where the reaction pressures are beyond the range of the effusion method, a heterogeneous equilibrium is established in a capillary vessel, in which the substance of unknown activity participates and determines the pressure of one or more constituents of the gaseous phase. The composition of the gas mixture in the vessel can be established by condensing the vapours escaping through a capillary opening in the vessel, and analysing the condensate. Applications of this method were also discussed.

### Mechanical Properties

The session on mechanical properties at high temperatures, opened with a Paper by **E. W. Ward** (A.R.D.E., Woolwich) on high temperature mechanical working of molybdenum; the factors affecting the breakdown of the arc-cast structure were discussed, and the microstructures produced by rolling and extruding at temperatures up to 1,800°C. were shown. Ingots are heated in a hydrogen atmosphere in a furnace with molybdenum rod elements, and are usually worked by rolling, either through grooved or flat rolls. True hot working was achieved by this method.

Two Papers concerned with the measurement of mechanical properties followed. **L. M. T. Hopkin** (National Physical Laboratory) described determinations of the creep properties of ceramics and high melting point metals. It was found that strain is most satisfactorily measured by a dial gauge on the loading lever, and apparatus was described for creep testing ceramics in air in a small creep machine and a modification was described for testing high temperature metals *in vacuo*.

**B. L. Mordike** and **L. M. Fitzgerald** (Cambridge University) are investigating the properties of the refractory metals tantalum, tungsten, niobium and molybdenum and the carbides of tantalum, tungsten, niobium, titanium, zirconium, vanadium and boron up to their melting points, which lie in the range 2,500° - 3,500°C. The extreme temperatures for the experiment are produced by a carbon tube resistor furnace. Apparatus to measure the tensile strength of metals, friction of carbides and hardness determination of both metals and carbides were described, and the possible extension of this work to other materials and properties was discussed.

An extension of the simple theory of the thermal stresses in flat plates, so that variations with temperature and stress of the thermal and elastic properties of the material can be taken into account was presented by **D. M. Gilbey** (R.A.E., Farnborough). This theory has been used to calculate thermal stresses in two simple shapes under steady state heat-flow conditions and for a variety of thermal conductivity, thermal expansion, and Young's modulus values, thought to be appropriate to a manufactured graphite. The stresses calculated by this method were compared with those obtained from the simple theory using constant "effective values" of the "constants".

The session concluded with a Paper by **D. T. Livey** (A.E.R.E., Harwell) on the high temperature stability of oxides and sulphides. The vapour pressure data for the refractory oxides were reviewed, and a comparison made with the calculated decomposition pressures. In most cases the observed vapour pressure is higher than the decomposition pressure, indicating the existence of stable gaseous oxide molecules. The behaviour of the stable refractory oxides in vacuum, oxidizing and reducing atmospheres was considered; beryllium oxide is outstanding *in vacuo* and in a reducing atmosphere. The refractory sulphides are thermodynamically less stable, in general, than the oxides and their reactiveness is correspondingly greater. They have proved useful towards liquid metals, however, and the sulphides of cerium and thorium have been used for reactive metals.

Consideration of the general problem of metal containment in oxides and sulphides shows that kinetic factors, rather than thermodynamic stability control the degree of reaction, at least for the more reactive metals.

During the symposium, an exhibition of apparatus, refractories, etc., was held at the University Department of Metallurgy, exhibits being loaned by a number of industrial firms, research establishments and university departments.

## Obituary

### Mr. F. A. Spence-Brown

WE deeply regret to record the death of Mr. F. A. Spence-Brown, a joint managing director of Johnson, Matthey and Co. Limited, who died suddenly on September 29.

Joining the board in 1943, Mr. Spence-Brown had been with the company for over 40 years. He was a former assistant manager of the Birmingham branch, and had also served the company in Canada and Sheffield.

**Pressure Die-Casting Review**

# Porosity in Zinc Die-Castings

*In this article the author, K. Ruttewit discusses the occurrence of porosity on the surface and in the interior of pressure die-castings in zinc alloys, and points out some of the factors that give rise to this type of defect. The article, which first appeared in "Metall," has been specially translated from the German for "Metal Industry."*

At the present stage of development of the technique of pressure die-casting, it is not possible to produce a completely pore-free pressure die-cast part. The nature of the pressure die-casting procedure requires that the time needed for the metal to run in to the die cavity, and for the air to be expelled, is most often only fractions of a second. The air cannot be absolutely expelled by the injected metal, particularly where the die-castings are of complicated shape, and where air blockages or impediment can occur. This retention of minute amounts of air within the die can form fine pores, blisters, or even hollow spaces, in the die-casting.

Porosity formed in this manner occurs not only in the interior of the die-castings, but it may also become noticeable on the surface. Porosity and blistering are phenomena which trouble the producer, electroplater, and the user of die-castings, and research is constantly being conducted to obviate this trouble, which is one of the chief problems encountered with pressure die-casting production. Although it is well nigh impossible at the moment to produce a pressure die-casting completely pore-free, there are, however, ways and means of reducing the porosity to a minimum and so avoiding consequent difficulties.

The mechanics of filling a die of a quite simple shape by molten metal are of a very complicated nature. The metal flow is subject to flow laws, but with pressure die-casting the position is so complicated that the laws have only a conditional application. In consequence, the productive inception of a new die-cast part is still, for the greater part, empirical. Each particular case requires special sectioning, venting, application and distribution of the metal flow channels, etc. The position of the sprue on the die-cast part is of decisive importance in this connection. This will depend to a great extent on the shape of the part. The experience of the die-caster must be allied with that of the die designer, in association, also, with casting machine design and details. The customers' wishes also have to be considered. The die must be designed so that, within the limits of possibility, the finished die-cast part shows as low a porosity as possible.

The nature and position of the pores in the die-casting are also of considerable importance. Every die-cast part will have more or less fine and very fine pores, or small blisters, under the casting skin. Their distance from the surface will be variable. If they are just under the casting skin they will initiate trouble. If they are deeper down or, better, completely in the interior of the die-casting, then they are generally relatively harmless so far as subsequent treatment processes, such as electroplating, are concerned. If too numerous, however, the interior porosity can reduce the ultimate mechanical strength of the die-casting. If the part has to be pierced, so that liquid or gases flow through when in use, interior pores can then be troublesome. Bores intended to be quite separate may be linked by a large pore. Defective parts of this type can be tested with compressed air, but usually have to be scrapped. Porosity control can reduce this scrap.

For this reason, in Germany, very strict specifications are applied for the surface quality of pressure die-castings—excessively strict, in fact—so as to ensure that defective die-castings that have passed through the electroplating stage, or even have passed along to the user, are held at a minimum.

## Causes of Porosity

The causes of porosity in the as-cast die-castings are manifold, and it might seem at first sight that it is most difficult, if not impossible, to produce satisfactory die-castings. This is not, however, the case. Pore formation in the die-castings needs to be classified into two sections:—

(1) Pore formation in the untreated cast part, which becomes noticeable immediately after the pressure die-casting process or after a certain storage time.

(2) Pore formation during and after subsequent surface treatment.

The first requirement for a sound cast part is the use of high purity zinc alloy, such as that specified in German Standard DIN.1743 and in the British Standard B.S.1004. Impurities of cadmium, lead and tin in amounts in excess of those in the above specifications, not only have an effect on the corrosion behaviour but also facilitate pore and blister formation during plating.

High purity zinc alloys are sensitive to overheating. If the maximum melting temperature of about 460°C. is exceeded, not only does a reduction in the mechanical strength properties of the die-casting occur, but this overheating is also favourable to pore formation. In addition, overheating leads to dross formation (oxidation) and this, when incorporated in the metal, increases the viscosity of the melt and leads to eddying in the die. This eddying can cause large-size pores, which later show up as blisters in the die-casting. It is advisable to top-up the holding furnace with fluid instead of solid metal. This reduces the formation of oxides. It is also easier to hold the temperature of the melt constant when topping-up with fluid metal.

At normal melting temperatures, aluminium-containing zinc die-casting alloys only attack iron to a small extent; with superheating, however, hard iron-containing metal compounds can be formed, which can influence the viscosity of the metal. The most serious danger associated with overheating occurs in the furnace used to melt down scrap (runners, sprues, flash, deburring scrap, etc.). Temperature control equipment should be used at all the necessary points where the molten metal is being melted or held, to ensure that no overheating takes place.

Zinc die-casting alloys are not exceptionally sensitive to gas absorption. However, if the molten metal has been overheated, and some gas absorption has occurred, then as soon as the metal reaches a cooler region of the die-casting machine, the excess gas will again be expelled. Under the effect of the cooling of the metal in the die, with the consequent quenching action and contraction, pores and hollow spaces may be formed. On being sectioned, gas blisters usually have a bright appearance. Foamy metal must also be guarded against, and sufficient venting must be provided.

With gas-heated melting furnaces, care must be taken to ensure that hot combustion gases do not gain access to the metal. If graphite melting crucibles are used, care must be taken to avoid the percolation of gas through the walls of an old crucible; the crucible should be changed if this happens.

Various other factors will give rise to pores. Thus, a die that is too cold, or metal at too low a temperature, will lead to this trouble, because the air-venting channels provided will quickly become blocked with solid metal, so that the air can only partially escape. If the air venting is insufficient—the minimum thickness of the air venting channels is regarded as 0·1 mm.—then pore trouble will arise. The copper-containing zinc alloys are not so sensitive in this respect as the copper-free alloys. A fruitful cause of pore trouble with die-casting is faulty air venting—as each die for a new part is being

designed, the venting system should receive a special study.

Die temperature control is important and castings should be rejected as scrap until the mould has reached the correct working temperature. Sometimes it will be found necessary to cool the mould in production. Temperature measurement of the surface temperature of a die is difficult. Temperature measuring paint-pencils are not precise enough. They can only be used for broad measurement purposes. A useful control is temperature measurement of the die cooling water. The mould temperature generally should be between 200°-250°C., and should not be allowed to fall below about 175°C.

Too low a casting pressure, or too high a casting speed, can likewise lead to porous castings, and experience with particular dies is a useful guide in this direction. The die-casting machine design also exerts a certain influence. Tests conducted in this connection with a hot-chamber compressed air and a plunger machine showed that the die-castings produced with the plunger-type machine gave a higher density and were more compact.

The over-generous use of lubricants can also lead to porosity. Varying opinions are held on the extent of lubricant to apply—some authorities even consider it should not be used. Lubrication of the cylinder of cold chamber machines is particularly troublesome. The die-casting stage should have ended before solidification takes place. Otherwise, there is the danger of internal stresses forming, causing porosity. Contraction in the mould can also give trouble.

The removal of surface defects and pores by grinding is not only expensive, but can remove the casting skin completely. This will expose further pores under the skin. These pores will become filled with polishing medium and metal powder, and the finer pores cannot be seen by the naked eye. The material will not be removed during degreasing, or, if so, will fill up with plating electrolyte, and this will lead to trouble during plating. Such parts are unsuitable for plating, and in serious cases the plating can lift completely from the sub-surface. Ultrasonic degreasing has been found very satisfactory for preparing die-castings for plating—any small pores present are presented clean to the plating bath. A heat-treatment at 210°C., applied before polishing for plating, will render some surface defects invisible. Hard inclusions of oxide, etc., can be torn out during the grinding and polishing, giving a bad surface for plating.

Too great a use of casting scrap can lead to porosity; no more than 30 per cent of this material should be added to the fresh metal melt. Cleanliness is an absolute requirement with the use of all waste material for remelting. A pre-melting should be given and the material cast into ingots; these are then added to the production melting pot.

Porosity can also lead to machining troubles. During boring and threading operations, drilling swarf can become packed in the pores, leading to considerable local temperature rise, reduced tool life, and the rise in temperature can even reach the melting point of the alloy at the point of the boring. Tool breakage may also occur.

A cracked surface can occur on a die-casting as a result of its sticking to the walls of the die—parts of the surface are torn away during the ejection of the finished part. Vacuum pressure casting to combat porosity does not yet appear to be an absolute answer to the problem. It will undoubtedly, however, assume greater significance in die-casting practice.

Intercrystalline corrosion occurring before and after plating is a serious consequence of porosity. Blistering after plating of die-castings would seem to be associated with the surface polish and the formation of a diffusion layer, formed from the applied copper sub-plate and the zinc. The gamma and epsilon phases of the zinc-copper system are particularly brittle. The diffusion layer appears to be promoted more by a polished surface, and this agrees with practical experience that blistering troubles with plated zinc die-castings are more pronounced with surfaces which have been over-polished. Alkaline degreasing also has an influence on the formation of the copper - zinc diffusion layer. The longer the alkaline degreasing is, then the thicker will be the diffusion layer. It has been found in practice that with the use of a milder degreasing medium, the rejects due to blistering after plating are reduced. As the maximum dip duration for the alkaline-cathodic cleaning, 30 sec. is recommended. In many quarters, a change-over from cathodic to anodic alkaline cleaning is recommended. With too long a cathodic cleaning treatment, an undesired activation of the zinc alloy surface by hydrogen can occur.

# Correspondence

*Correspondence is invited on any subject considered to be of interest to the non-ferrous metal industry. The Editor accepts no responsibility either for statements made or opinions expressed by correspondents in these columns*

## One Better — Sales Efficiency

To the Editor of Metal Industry

SIR,—"Skimmer" has been skimming again—and in a vacuum too!

In the issue of 25 July he accuses powder metallurgists of "remarkable indifference" for using ready-made powders, and makes an entirely irrelevant comparison between the foundryman and the powder metallurgist.

Admittedly ("Skimmer's" favourite word? He begins three key sentences with it) the metallurgist concerned with the quantity production of precision components is content to rely upon the powder suppliers' metallurgists—they, too, are powder metallurgists—and concentrate upon his own problems.

Do the small foundries consider it advantageous, in their own interests, to make their own ingot metal? "Skimmer" is welcome to teach the makers of sintered components how to make their own metal powders but—a word of advice—if he encourages anyone consuming less than 5,000 to 10,000 tons per year to do so, he should avoid being personally responsible for their losses!

Vacuum sintering is already well established in the rare metals field, and the purity of these products is incidental evidence of the effectiveness of the metal powder technique, but the major role of powder metallurgy lies in the economical production of large numbers of relatively small precision parts; a field which is separate from, and complementary to, the low precision, almost unlimited size, and relatively small numbers usual with the foundry techniques.

Incidentally, the steel industry, at any rate, welcomes the recent introduction of high purity powder briquettes for use as melting stock. Is it the foundryman's turn to be accused of indifference?

**Hugh G. Taylor.**

Höganäs, Sweden.

To the Editor of Metal Industry

SIR,—Having read your editorial on "Sales Efficiency" in Metal Industry, 19 September 1958, I strongly disagree with one of your points.

A representative is the ambassador of his company and, as such, it is necessary for him to maintain and expand his personal contact with customers and prospects. A positive, personal approach is essential as the representative must "sell himself" before he can sell his company's products.

I believe that a telephone call will never serve the same purpose as a personal call.

It is generally acknowledged that telephone selling is an art in itself, and it would be difficult to discuss technical aspects in this manner. I regard this suggestion as a negative not a positive approach to increasing sales.

Yours, etc.,

**L. D. Roper,**
*Sales Manager,*
Williams Alexandra Foundry Ltd.
East Moors Road,
Cardiff.

**During the Golden Jubilee Autumn Meeting held by the Institute of Metals in Birmingham, a number of Midland works was visited by delegates. One of these was the Wolverhampton Die Casting Co. Ltd. which is described here, and another was the Metals Division of Imperial Chemical Industries Ltd., whose Research Department is also described.**

*A general view of some of the flow lines at the Wolverhampton Die Casting Co. Ltd. The die-casting machines are at the far end*

# Wolverhampton Die Casting Co. Ltd.

VERY early in the history of pressure die-castings, in fact, in 1918, a venture was started by two brothers and their brother-in-law who came from the family of one of the oldest printing establishments in Wolverhampton, and thus the foundations of the Wolverhampton Die Casting Co. Ltd. were laid.

Early die-castings were largely in lead- or tin-base alloys, including the re-metalling of bearings for the increasing number of cars and motor cycles then appearing on the roads.

Zinc alloys were also cast, on hand-operated machines but, owing to the methods of zinc production then current, and casting in the consequently unreliable alloys, large-scale development had to wait more than a decade.

During this time, however, gradual developments took place in die-making techniques, and much ingenuity went into improving casting machines.

With the development in America of a process for producing high-purity zinc of more than 99·99 per cent, the future of the industry was assured, and in the early 1930's the first power-operated machine was installed by the company. Many more were added during the next few years, and the old hand-injection machines were gradually replaced by more up-to-date equipment.

A demand for larger castings led to the development of special machines by the company's own staff, and in one particular instance two machines were lashed together to cast car wind-screen frames, as the die was too large to be locked together successfully by one of them.

With 30 machines continually in operation by 1939, a premier position in the industry was attained. This was recognized during the second World War, when a considerable part of the plant was dispersed in a specially constructed factory with each die-casting machine in its own reinforced shelter.

Production was rapidly stepped up, and by 1942 had increased sevenfold. Throughout this period, technical advice and information were freely given to the trade in general so that processes the firm found successful could be more widely applied.

Four separate factories, all within half-a-mile of the parent works, are now engaged in die-casting production, and these cover a floor space of nearly 400,000 $ft^2$, well over one hundred die-casting machines being fully employed. Approximately 2,300 workpeople are employed.

## Alloy Control

Experience gained throughout the early struggles to produce high tensile and age-resistant castings has not been forgotten, and constant care is exercised to avoid impurities contaminating the alloy.

The company's policy of casting only in high-quality alloys was the first step towards improved castings, and this was soon followed by the purchase of the first spectrograph and the establishment of a small laboratory. In 1939, a Philips visual X-ray was obtained, and some time later radiographic equipment was added to deal with larger castings and provide more permanent records. By 1950, three spectrographs were in continuous use, checking samples from every machine at least twice a day.

Four years ago a special department was set up to re-ingot all sprues and gates, etc., under laboratory supervision. Provision was made to correct any loss of aluminium or magnesium created during the process of melting great quantities of comparatively small pieces.

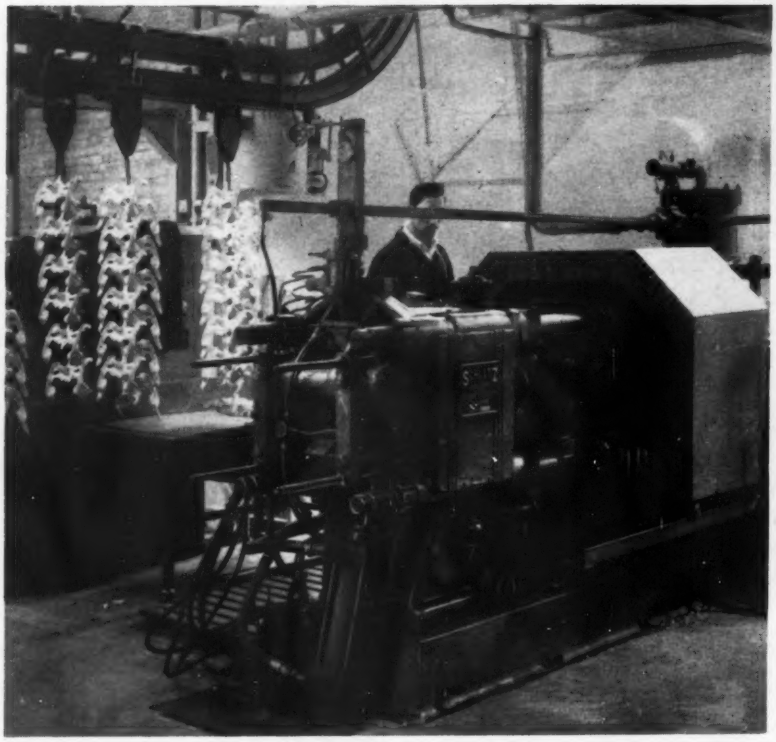
In this department, three furnaces are situated in line, all raised about 2 ft. from floor level, the two outer ones being used to feed the one in the middle, which is arranged to tilt towards an ingotting machine capable of casting one ton of metal in 25 min. Sprues, gates and pre-production castings are loaded into the left-hand furnace by means of a specially-designed drop pallet, moved into position by an electric block.

Each furnace holds 30 cwt. of metal, although for rapid melting it is usual to maintain a heel of 15 cwt. of molten metal at all times. This melt is usually low in aluminium and magnesium.

The right-hand furnace is loaded with 99·99 zinc and, when molten, aluminium is added from a nearby semi-rotary furnace, followed by a suitable quantity of magnesium. These amounts are sufficient to counter any loss found in the left-hand furnaces.

When the metal in both furnaces is melted, half a ton is transferred to the centre furnace from each of the side furnaces, using a pump of quite simple design.

An immediate laboratory check is made, and metal flows from the centre furnace down a launder and into the



*At the die-casting machines : the storage conveyor protects individual castings from handling damage by suspending them in "trees," as opposed to the traditional use of stillages, pallets, and fork lift trucks*

ingotting machine. The ingots are carried back to the foundry by an electric truck and placed on top of the machine furnaces ready for remelting with the minimum drop in temperature.

Laboratory control over remelted material (gates, sprues and vents, etc.) is greatly simplified by the use of a Hilger and Watts direct-reading spectrometer of the latest design.

## Zinc Alloy Die-Casting Shop

The majority of the machines casting zinc alloy are situated at Graiseley Hill, where castings from 25 lb. to a fraction of an ounce are produced. All have hydraulic closing mechanisms and, in the main, compressed air provides the power for injection.

Situated at the side of the casting plant is a building housing compressors capable of delivering over 2,000 ft$^3$/min. of air at 110 lb/in$^2$. A recorder is fitted to the main air line to ensure that a constant watch is kept to avoid any fall in line pressure.

Periodically, a special testing jig is fitted under the injection ram of each die-casting machine to check any wear that may have taken place between the cylinder and piston, thus allowing air to by-pass the piston and reduce the metal pressure.

To prevent any outside source from creating a temporary drop in pressure, all compressed air for any other purpose is provided by further compressors situated in various other departments.

Cooling water for the dies is provided by a large water cooler situated nearby, which, with the cooling water required for the hydraulic pumps, passes from 10,000 to 15,000 gal/hr.

As a result of the rather high degree of hardness in the local water, for many years much labour was expended in drilling clear the choked water channels. This problem has now been dealt with, and all town water is now treated by a large softening plant before being allowed to flow into a 20,000 gal. reserve tank located under one corner of the foundry building.

From this tank, water is pumped by a battery of four 6,000 gal/hr. pumps, arranged to cut in, one after the other, according to demand, the control being arranged by air pressure acting on the water in a 500 gal. tank, with the pressure switch cutting out at 40 lb/in$^2$. Every effort is made to maintain the same temperature of cooling water at the machines during all seasons of the year, and the system is arranged to run through the cooler with the fans cut out if the temperature falls below a set point, and during exceptionally cold weather the cooler can be partially or completely by-passed.

Because of the importance of compressed air and water cooling, the maintenance department for the casting plant is situated adjoining the compressor house, where the various controls can be watched by all personnel when passing through, and any change of heat is instantly noted.

The maintenance department is equipped with sufficient machines to deal with all honing of goosenecks, fitting of pistons, and turning of nozzles, the range of which varies from large ones, with piston sizes up to 5¼ in. diameter, down to small types fitted with 1¼ in. pistons.

To cover the removal of cracked melting pots and failing goosenecks throughout the 24 hr., a team of men alternates shifts, half days and half nights.

Most of the various methods of furnace firing have been tried, and at the present time oil, gas, electric resistance, and induction heating are used, but by far the greatest number of furnaces are gas-fired.

Four separate sub-stations with transformer capacity to deal with a kVA demand of 2,500 are fed with H.T. current at 6,000 V. Capacitor equipment is arranged to maintain a power factor of 0·95.

The main zinc foundry presents a considerable ventilation problem. It has an area of 36,000 ft$^2$, 300 ft. long, divided into six north light bays. Thirty-five 6 ft. sliding windows and 25 Giant Colt ventilators are provided in the roof to relieve temperature during most of the year.

A die stores is situated below a trimming department, which adjoins the foundry, and dies are brought by lift as required. Some 8,500 dies are carried in reserve in the die stores. An average of 30 die changes is made on standard type dies during a 24 hr. period.

Several machines are equipped with special dies suitable for four separate interchangeable smaller dies. The method of clamping makes this type of die very easy to change. The die storage capacity for this type of die has now reached 2,500.

Shift work is operated on the die-casting machines, two teams of operators working two weeks on night shift and two weeks on day shift alternately.

Each chargehand is generally responsible for eight machines, and supervises the die changing, training of operators, and general supervision of the production from his quota of machines.

The majority of castings are either broken off or pressed off from their gates and vents at the machines, and placed in pallets. After acceptance by a patrol inspector, the castings are moved by fork truck to the various trimming departments, according to the instructions laid down on the work chart.

## Trimming and Finishing

The trimming departments at the Graiseley Works cover over 75,000 ft$^2$, and many thousands of jigs and tools are in use.

*One of the "flow lines" showing the belt conveyor that carries the work past the machines for drilling, milling, etc., to inspection, and, in the foreground, packing*

Much time has been devoted, and investigations are always being carried out, to obviate the old-fashioned method of hand filing. Although back stand linishers, bobbing machines, capstans, etc., have considerably improved the standard of the finished product, there are still a few components where the quantity required is too small, or the shape, too difficult, and recourse has to be made to hand filing.

When an original small order is repeated in larger quantities, the methods department reviews the new situation in an effort to devise a jig or press tool to obviate hand work.

## New Flow-Line Plant

About five years ago it became apparent that, with the increasing number of automatic polishing machines being employed by pressure die-casting users, more attention to protection from damage in transit was demanded of the producer of die-castings.

During transport from one operation to another, small scratches, indents and other minor damage may occur. Such marks, normally removed where hand polishing was used, were being shown up by the automatic machines, thus creating an increase in scrap.

This problem has been solved in many American plants by conveying castings direct from the casting machine to the trimming line, then on to a polishing machine, and direct to an automatic plating plant. After plating, the finished parts are removed from the plating jigs and placed in boxes for despatch to the customer.

The Wolverhampton Die Casting Co. Ltd. was in a different position. The majority of the large customers already polished and plated their own castings, and by American standards the quantities required were much smaller and the greater number of different components demanded a more flexible system.

During 1954, it was decided to build a new plant incorporating the latest ideas suitable for the production of damage-free high quality castings.

Experiments made previously with a battery of automatic die-casting machines had shown that this type were essential. Methods of metal feeding and firing of the furnaces had received a great deal of consideration. The one offering the most ideal condition appeared to be a recently developed launder system made in America by Ajax Tama Ltd., of Trenton, using electric induction furnaces made in England under licence by Birlec Ltd.

The plant, incorporating eight complete units, has now been in operation for some time, and visitors from all parts of the world have expressed their admiration of its efficiency.

Whilst it is desirable, in view of the high capital cost of the die-casting machines, that they should be employed both day and night, female operators are used for many finishing operations, so that for trimming, night work was out of the question. This presented the problem of storing castings at night to await finishing during the day shift. For this problem, an answer was found in the Fisher and Ludlow "Flowmaster" conveyor, then on trial at their development centre. This would store 12 hours' castings in the roof of the building ready for the finishing operation during the day.

To treat all the castings produced from one machine in 24 hr. down one finishing line during daytime necessitated considerable investigation on the part of the planning department, as all the various operations would have to be balanced to conform to a standard production rate, approximately twice that of the casting machine.

Hundreds of operation cards were checked to give some guidance on the various numbers of each type of machine required, although it was obvious that by the time the proposed plant was in operation many of the components would have been changed by the customer.

A belt conveyor was decided on, and alongside this were arranged a suitable number of power points, so that all machines could be easily moved into any position and changed if necessary.

## Aluminium Production

Aluminium castings have been produced for the past 20 years. The present building was erected almost ten years ago to cover an area of 15,000 $ft^2$. Since this time, a further 4,000 $ft^2$ has been added, and the great increase in demand for castings has recently necessitated the complete removal of all trimming operations to the Paul Street works, thus making room for further die-casting machines.

The present plant comprises 20 machines. The two largest machines will accommodate dies up to 34 in. between tie bars, and 12 others take dies from 24 in. to 27 in. between tie bars. The locking pressures range from 300 tons to 600 tons.

The Raglan Street and Paul Street works have a total floor space of 180,000 ft$^2$.

To these factories are diverted all the parts requiring special attention, such as sets of parts, small sub-assemblies and parts needing extra security arrangements. Plating equipment was first introduced over 20 years ago, starting as a service to small customers who had no facilities of their own.

The present polishing shop has spindle capacity for 64 operators; the jig wiring section is in the same department, its work being carried by overhead conveyors to the adjoining plating shop. Both these shops have recently been completely refitted and expanded, following their transfer from the Graiseley Works to Paul Street.

Situated at Paul Street is a vapour blast plant, a chromating section, and a spray painting department, complete with an automatic spray painting and stove drying machine suitable for large quantity orders.

# Imperial Chemical Industries Ltd., Witton

By W. H. HODGETTS, M.I.Prod.E.

(*Concluded from* METAL INDUSTRY, 26 *September* 1958)

A CONTINUAL search for technical improvement is essential to the success of the modern industrial firm, and particularly important in the highly competitive non-ferrous metals industry. For this reason, I.C.I. Metals Division has for many years provided a research organization as an aid to its commercial ventures. Its function is to anticipate the needs of the Division by means of long-term investigations and to assist production departments in any problems which require specialist aid and equipment.

To fulfil this assignment, the department is staffed by some 300 people, about one-third of whom are university graduates or their equivalent, qualified in metallurgy, engineering, physics or chemistry. The research programme is carried out by the four groups into which the department is split, each group being subdivided into a number of sections.

(1) *Metallurgical Group.* This group is mainly concerned with investigating problems arising in the production and use of copper, aluminium, and their alloys. Its work involves intensive study of properties, fabricating techniques and performance under widely differing conditions.

Melting, casting and jointing processes are continuously investigated, while determinations of the effect of heat-treatment and other processing conditions ensure that the best use is made of materials and manufacturing techniques.

One section of the metallurgical group is concerned with the newer metals, such as beryllium and niobium, which are likely to find increasing application in the nuclear energy field. Another section carries out studies on the performance of rolls, extrusion dies, and hard metal tools.

(2) *Titanium and Zirconium Group.* Work on titanium started in the department in 1949, and contributed in no small measure to the company's decision to build a plant for the production of raw titanium at Wilton, a melting plant at Witton, and a modern processing plant in South Wales.

The industrial development of titanium, an essentially complex metal, has been accompanied by fundamental research into its behaviour and alloying characteristics. This work continues, together with investigations into another "new" metal, zirconium, which is already being manufactured commercially by I.C.I. Metals Division and which is likely to be used in appreciable quantities in certain types of nuclear reactor.

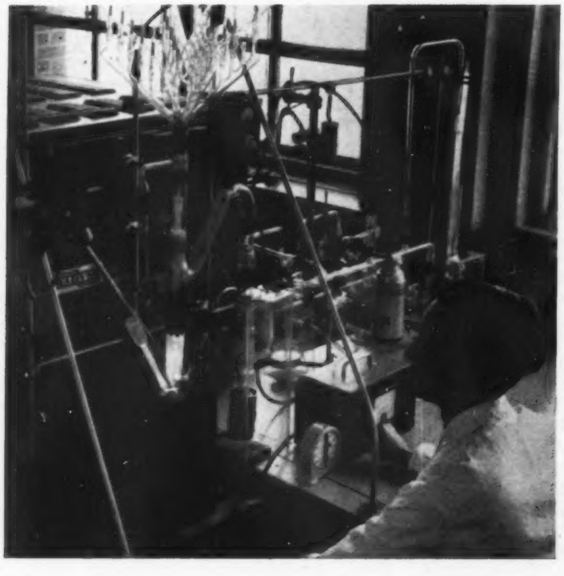
(3) *Engineering Group.* The need for continual improvements in the Division's basic manufacturing processes is the particular responsibility of one section of this group, which studies the factors affecting the efficiency of rolling, extrusion, drawing and pressing techniques. The group is also responsible for establishing experimental data on the mechanical properties of metals and alloys, and for measuring their electrical, magnetic and thermal properties.

Metals Division operates the I.C.I. creep test station, recently extended, where tests are carried out not only for the company but also for various Government departments.

Another section investigates certain aspects of instrument construction and use.

(4) *Chemical and Physical Group.* A vital function of this group is to supply information essential to the work of the other groups. Accurate analytical methods are necessary when alloying elements and impurities must be controlled to minute fractions of one per cent, and one section is concerned with developing such methods. It is important to note that the problems of analytical control of the newer metals required for nuclear energy purposes are particularly complex, since impurity levels of the order of a few parts per million are often vitally important.

Effects of corrosive attack in a wide range of media are studied in another section, which also carries out experiments designed to increase fundamental knowledge of corrosion. Still another section is responsible for investigating surface treatment processes, while the crystallography section uses X-ray and radiographic techniques to provide information on the structure and texture of metals and alloys, and investigates the properties of surface films by electron diffraction techniques.



*Analysis of titanium in progress in the Research Department*

# New Plant & Equipment

## Plate Shearing

FOR sheet and plate from 6 ft. $\times \frac{1}{4}$ in. to 12 ft $\times$ 1 in., a range of guillotine shears has been introduced by Brookes (Oldbury) Ltd., Oldbury, Birmingham. The table is of fabricated construction with a fully machined top surface and front edge. Micro adjustments are provided for accurate setting of blade clearances. Extension arms, which are adjustable, have machined top surfaces.

The beam is mounted in full length slides, fitted with adjustable gibs and phosphor bronze facings, ensuring precision of movement. The beam is directly connected to the two hydraulic cylinders, which are mounted on either end of the machine.

Return of the beam is by means of two separate hydraulic cylinders working on the accumulator principle. By this means the beam is held in its upper position securely in between strokes, and this condition is maintained even when the hydraulic pump is not operating. A simple valve allows the beam to be inched down to allow for easy setting up of the blades and the checking of blade clearances throughout their whole length.

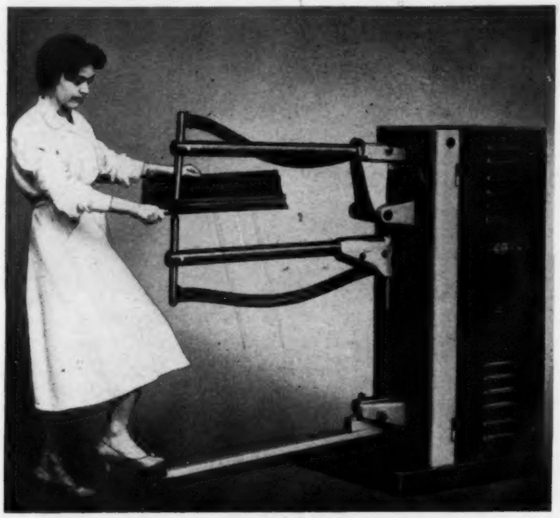
Rake of the blade is simply and easily adjusted by turning the nut on the connection between hydraulic cylinder and beam.

Pressure release valves prevent the possibility of damage due to overload of the machine. The hydraulic hold-down is extremely positive, and does not require adjustment for varying thicknesses of plate. An adjustment is provided which enables a variation of pressure to be applied to suit various types of materials and prevent damage to polished surfaces.

A sequence valve built into the hydraulic system ensures that the work is positively clamped before the beam starts to move.

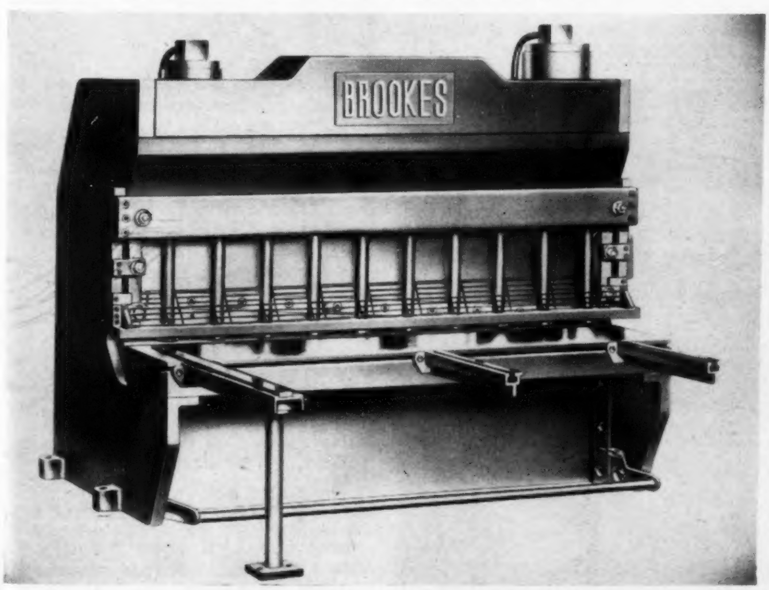
The hydraulic system is completely self-contained, and valve gear is of special monobloc construction, mounted in the oil tank to keep pipe joints to a minimum.

The machine is operated by a foot bar which is continued the whole length of the machine. Single depression operates the machine, and the beam returns automatically at completion of stroke. If the operator removes his foot from the bar before completion, the beam will return immediately, and this can be used to excellent effect when cutting narrow strip to obtain high production figures.



*The Sciaky S.F.15 foot-operated spot-welder*

*The hydraulic guillotine shears manufactured by Brookes (Oldbury) Ltd.*




## Spot Welding

WITH a working throat depth of 30 in. and an electrode stroke infinitely adjustable to a maximum gap of 4 in., a new version of the S.F.15 foot-operated spot welder has been introduced by Sciaky Electric Welding Machines Limited, of Slough. Machines of 12 in. and 24 in. throat depth are also available.

A top screw on the pedal bracket gives instantaneous stroke adjustment without having to open the covers. The foot pedal is radially adjustable and the normal height above the floor (irrespective of electrode stroke or pressure set) is less than 11 in., providing a comfortable working position.

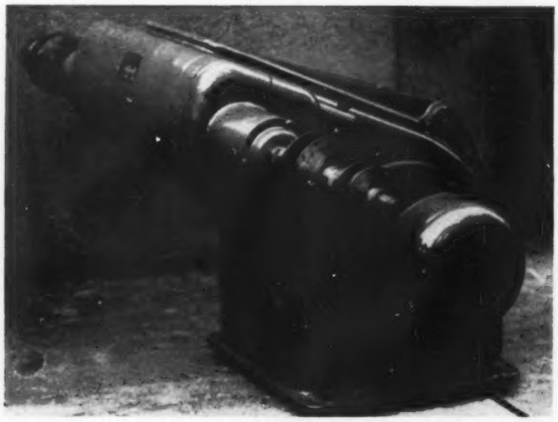
Electrodes are water-cooled, and machined with a $\frac{5}{8}$ in. diameter B.S.S. 807 taper.

The control circuit is operated by a Sciaky electronic thyratron timer giving weld times from 3-150 cycles.

## Polishing

A POLISHING and buffing lathe which allows tensioning and laxing of the vee-belts from the front of the machine is now being marketed by Grauer and Weil Ltd., 3-4 Hardwick Street, London, E.C.1.

The simple turning of the housing alters the working height, and it takes less than a minute to change the spindle speeds. The possibility of short circuit is completely eliminated



*"Pensel" polishing and buffing lathe—a production of Grauer and Weil Limited*

since the motors remain stable in one position, being bolted to the body. Idling pulleys, movable platforms for the motors, levers and tightening screws have been eliminated.

The machine is equipped with two motors, two spindles and two hand-operated switches, and each operator is thus able to effect all tasks without hindering the other.

Motors and bearings are double sealed off and completely dustproof; efficient transmission of power and long belt life is achieved by the use of multiple belts in place of the usual one or two.

The machine is free from vibration when running, and its top surface cooling makes it capable of carrying a heavy overloading. All switches are equipped with silver contacts for operating safety.

These machines can be supplied for use by a seated operator, which is particularly advantageous where female staff are employed. The more conventional machine for standing operators is also available. A complete range of backstand equipment to suit the machine can be supplied.

OPENING OF NEW BUILDING AT ASTON CHAIN AND HOOK COMPANY LIMITED

# Development Laboratory

OPENED recently, a new £15,000 laboratory block at the Erdington (Birmingham) works of the Aston Chain and Hook Companv Limited marks an important stage in the development of a policy in which the laboratory becomes the headquarters of a development department completely integrated with every form of works and staff activity from process control to work study.

The development department undertakes routine chemical and mechanical testing of casting, drawing and strip mill products, together with control of casting techniques and heat-weight calculation.

A recent innovation, due to expansion of the strip-rolling facilities, is the appointment of an assistant to the development manager, responsible for all the technical aspects of rolled-strip production. This policy will be extended into other departments as occasions arise.

Production foremen are responsible for the quality and inspection of the metal which they produce, but the standards of inspection to which they work, and the quality control procedures adopted, are laid down by the development department, which also acts as arbiter in doubtful cases. Inspection is done by statistical quality control and sampling techniques.

Experimental development work is undertaken to discover the potentialities of new lines, to extend the range of existing lines, and to solve production problems on existing products.

*Part of the chemical section of the new laboratory at Aston Chain and Hook Co. Ltd.*

Process development, including design, specification and commissioning of new plant and equipment, plant layout, and the improvement of existing plant to increase productivity, is also a function of the new department. Much of this type of work is done in conjunction with the engineering department.

Since much of the development work involves work study applications, work study techniques are applied to all metal processing, handling, and layout work.

The establishment of time standards and bonus schemes for piecework operators and some job estimating is also carried out by this section.

In addition to the above, the department provides a technical service to the sales, production and administrative departments.

Time study and quality control are housed in separate offices within the works. Much of the development work is done in the factory itself, using production machines, and this calls for the closest co-operation between development and production departments.

Each project is allocated to an individual engineer, whose responsibility it is to progress the work as rapidly as possible. The department's work is co-ordinated by the development manager, who is responsible to the managing director for the efficient running of the department. In addition to this, a committee, chaired by the managing director and consisting of the heads of the production, engineering and development departments, meets monthly to discuss progress on specific projects.

# Industrial News *Home and Overseas*

### Costing a Casting

A brochure has recently been compiled at the request of many firms by the Cost Committee of the **Association of Bronze and Brass Founders** with the object of suggesting to members and non-members alike an easy method of estimating the cost of a casting, and of checking the estimate without additional cost. The methods set out in the brochure, which have been tried and tested in practice, are based on the experience of members who are practical foundrymen; and the authors have borne in mind that most of the firms in this country employ less than 20 employees.

The object of the authors has been to produce, by an orderly arrangement of existing information, a simple, practical and reasonably accurate method of costing which enables estimates to be realistically based on costs and checked against actual performance.

Particular attention has been given to metal cost, loss and cost of melting, and directions are given for their true assessment. Assumed figures of such costs often fall short of actual costs, and so can "average cost of conversion," so beloved of some foundrymen. By using this system the foundryman is led to shun such methods, however convenient, and to consider each casting individually.

This work has been undertaken as part of the association's Conditional Aid Activities, and is a contribution to sound management and better productivity. The publication consists of two books, the text and forms being bound separately for easy reference. It is on sale at £1 10s. 0d. net, and copies and further information can be obtained from the association's offices at 69 Harborne Road, Edgbaston, Birmingham, 15.

### A Course of Lectures

Commencing on Tuesday, November 4 next, a course of 12 lectures is to be given by Dr. C. B. Alcock, Ph.D., A.R.C.S., of the Royal School of Mines, on the subject of "The Use of Radioactive Isotopes in Metallurgical Research," at the **Battersea College of Technology,** London, S.W.11. The lectures will be on each Tuesday from 5.30 to 7.30 p.m. The fee for the course is £1, and applications for enrolment should be made to the secretary (R.I.Met.), The Battersea College of Technology, Battersea Park Road, London, S.W.11.

This course of lectures is intended primarily for research and plant metallurgists who are desirous of obtaining an insight into the scope and value of radiochemical techniques in studying metallurgical problems. Previous knowledge of the subject is not necessary, as the course will include a detailed consideration of fundamental principles. Ample opportunity will be provided throughout the course for questions and discussion.

### Head Office Move

After five years in Upper Brook Street, the London offices of **Midland Silicones Ltd.** will open in new and more spacious premises at 68 Knightsbridge, London, S.W.1, on Monday next (October 13). The move has been dictated by the steadily-increasing volume of business now being handled by the company—a member of the Albright and Wilson Group and a U.K. associate of the American Dow Corning Corporation.

Head office departments involved in this move include home sales, export sales, rubber sales, electrical and resin sales, fluid sales, water repellent sales, supply, publicity, and information departments. The M.S. south-eastern area sales office is also to move. The telephone number of the new headquarters is Knightsbridge 7801.

### British Oxygen in Derby

A new factory for the manufacture of oxygen and dissolved acetylene has been opened by **British Oxygen Gases Limited** on the Raynesway Industrial Estate at Derby. The company now has 46 oxygen producing and compressing centres, and 20 for dissolved acetylene, in operation throughout the country. The new factory is situated on an 11½ acre site, and a vehicle repair shop, office block and equipment stores are provided.

The oxygen compressing station includes a cylinder filling and loading deck, and a feature of the factory is a pipeline for gas supply which connects the local locomotive and carriage works of British Railways. The new factory received an official visit on Tuesday, September 30, from the Mayor of Derby and other local officials, who were conducted round the plant and entertained by directors of the company.

### The Foreman's Outlook

Industry requires more to-day of its foremen than it has ever done in the past. The modern supervisor needs a broad outlook on life and work if he is to fulfil his role as part of management. The thirty-sixth week-end conference for foremen and forewomen, organized by the **Industrial Welfare Society,** which will be held from Friday, October 24, to Monday, October 27 next, at the Hydro Hotel, Llandudno, is designed to provide an opportunity for delegates to take stock of themselves and their jobs, and to study the broader aspects of foremanship.

Fee for the conference is £11 11s. 0d. for delegates from I.W.S. member-firms and £12 12s. 0d. for those from non-member organizations.

### Platinum Metals

In the current issue of *Platinum Metals Review*, the quarterly survey of research on the platinum metals and of developments in their applications in industry, published by Johnson, Matthey and Co. Ltd., there are a number of interesting articles, including one on the "Care of Platinum Thermocouples" and another on "Platinum-coated Titanium Anodes." In addition, there are a number of abstracts of current literature on the platinum metals and their alloys, and a summary of new patents.

### Polythene Coated Aluminium Foil

It has been made known that **Fisher's Foils Ltd.** are now able to offer aluminium foil lined with polythene by a process of extruding polythene of between 0·00075 in. and 0·0015 in. thickness direct on to aluminium foil of from 0·00047 in. to about 0·004 in. gauge. Supplies may be produced in sheets or reels up to 30 in. wide. Polythene coated aluminium foil is stated to be an excellent barrier to the passage of moisture vapour and gas. By being heat-sealable it is a highly efficient packaging medium.

### Purchasing in Industry

A report of the Purchasing Research Sub-Committee of the **Purchasing Officers Association** has recently been published under the title of "The Organization of Purchasing in Industry." The report covers the need, and the reasons, for the integration of purchasing and stock control, and the way in which the joint function should be fitted into an industrial organization. The principles on which the unified function should be based are described and illustrated by charts.

In addition to the question of structural organization and the relationship of purchasing and stock control with other functions, the report deals with departmental organization and the detailed procedures involved from requisition through issue of orders, progressing, receipt, storage, control, and issue of stocks, to payment and the disposal of scrap or surplus materials.

The report thus gives a complete picture both of the administrative position of a purchasing and stock control department and of its detailed responsibilities and activities. The price of the report is 1s. 0d.

### A Removal

At the end of last month, **Acheson Industries (Europe) Ltd.,** formerly of Pall Mall, London, moved to offices in one of the City of London's newest buildings. Their address now is at 1 Finsbury Square, London, E.C.2, with the telephone number of Monarch 5811.

### Philippine Minerals

It has been reported from Manila that a "billion tons" of mineral ore, mostly iron and nickel, have been discovered in the southern Philippine island of Mindanao. The Philippine Bureau of Mines, in a report submitted to the Philippine President, said various minerals had been found in the Province of Surigao. The newly-discovered deposits were in addition to the iron-nickel ore previously discovered on Nonoc Island, off the coast of Surigao, and on Dinagat Island, between the two big islands of Mindanao and Leyte.

### Malayan Tin Shipments

Shipments of tin from Singapore during September totalled 367¾ tons, according to statistics issued by the Straits Trading Company. August shipments from Singapore amounted to 902½ tons. The September breakdown was as follows: The United States 22, Europe 46, Japan 180, the Pacific 62, India 8, South America 9¾, Australasia 32¼, and the Middle East 7¾ tons. There were no shipments to the United Kingdom, U.K. options, Canada or Africa during the month.

Shipments from Penang during the period were 2,386½ tons, compared with

$3{,}102\frac{3}{4}$ in August, as follows: United States 1,265, Europe 280, Canada 15, Japan $251\frac{1}{2}$, the Pacific $8\frac{1}{4}$, India 363, South America 130, Africa 13, Australia $42\frac{1}{2}$, and the Middle East $18\frac{1}{4}$ tons. No shipments were made during the month to the U.K. and U.K. options.

### Non-Ferrous Club

A very full gathering of members of the **Non-Ferrous Club** attended the October luncheon meeting, which was held on Wednesday of last week at the Queen's Hotel, Birmingham. The guest speaker on this occasion was Mr. G. R. Wolff, of the Commercial Metal Company Limited, who, in a most amusing and informative talk, described and defended the operations of the London Metal Exchange.

In the course of his remarks, Mr. Wolff said that the L.M.E. did not pretend to handle nearly all the non-ferrous metal in the world. A lot of people ran down the importance of the L.M.E. by quoting the small turnovers in relation to the hundreds of thousands of tons of non-ferrous metal produced in the world. This comparatively small turnover did not, however, detract from the importance of the L.M.E. as far as world contracts were concerned, as although little physical metal may pass through the market, thousands of tons of physical metal are priced on the official prices quoted on the L.M.E. In other words, the L.M.E. is really a barometer of trade. A great deal of unfair criticism had been levelled by the fact that the L.M.E. fluctuations were far too rapid, and, funnily enough, the loudest criticism came from those who were really generally responsible for this fact, namely, the large producers.

To explain this point more clearly, Mr. Wolff said that although the copper producers, and it is generally to the fluctuations in copper that major critics refer, use the market for pricing thousands of tons of material, they do their utmost to bypass the market as far as physical deliveries were concerned, and seemed to have a rooted objection to selling any metal on the Metal Exchange. This meant that as they used the market as a pricing basis for their outside contracts without putting any volume of physical material through the market, the L.M.E. still reflects the world prices, but fluctuations are necessarily far more sensitive owing to the lack of supplies or physical tonnage moving through the market itself.

At the close of his address, Mr. Wolff answered questions put to him by members. During the course of the meeting a collection was taken on behalf of the National Society for the Prevention of Cruelty to Children, and realized the sum of £19.

### Coil Annealing Installation

A contract, worth more than £500,000, for a large coil annealing installation at the new steelworks of the Sociedad Mixta Siderurgia Argentina has been secured, against strong Continental competition, by **The Incandescent Heat Company Ltd.** The order is for 25 single stack coil annealing furnaces with 72 bases, 32 forced cooling hoods, and three exothermic gas atmosphere plants, each rated at 10,000 c.f.h.

The furnaces are built to the design of the Lee Wilson Engineering Co. Inc., of Cleveland, U.S.A., for whom the Incandescent Company are manufacturing licensees. The plant will handle coils up to 60 in. in diameter in stacks up to 168 in. high, and will anneal annually 300,000 tons of cold reduced sheet and tinplate. The equipment will be manufactured and completely assembled at the Smethwick works of the company, and the order will be completed within 12 months.

*Method of construction; new aluminium acoustic ceiling*

### Aluminium Acoustic Ceiling

A product of Det Fyenske Traelastkompagni, of Denmark, the "Dampa" aluminium acoustic ceiling was introduced to the British market last week by the **Hurseal Heating Group** in co-operation with the **British Aluminium Company Ltd.,** by means of the showing of a film and a descriptive talk by the designer of the product to a specially invited company in London.

Extreme adaptability is claimed for the ceiling. Basically, it consists of finely perforated, stove-enamelled, narrow, aluminium strips with an inlay of specially processed mineral wool, combining a high capacity for sound absorption and insulation with light weight. This lightness and the unique method of suspension enables a fireproof, sound absorbing and insulated ceiling to be fitted to practically any building, because considerable latitude is possible in the siting of the widely spaced steel supporting channels which require only a minimum of fixing points.

The actual ceiling strips are simply clipped into lugs on the steel supporting channels and locked into the adjacent ceiling strip (see illustration on this page). The strips can be removed and refitted in any part of the ceiling as required. Recesses for standard lighting fittings or module lighting units can be easily arranged during or after the ceiling has been erected. Because of this special method of fixing and ease of working, the ceiling is economical to erect and, being already finished in stoved enamel, it is complete as soon as installed. The system of erection and nature of the aluminium strip also makes it possible to produce a heated ceiling, allowing the engineer the maximum freedom in positioning and pipe run.

For direct application to existing walls and ceilings, special panels are available as sound proofing and insulating facings. Again, being extremely light they can be easily and simply fitted to wooden battens with a stapling machine.

The "Dampa" ceiling is widely used on the Continent, and is now to be made and marketed in the United Kingdom. The special aluminium alloy for the strips and panels will be produced in this country by The British Aluminium Company Limited. Hurseal are also co-operating closely with J. Avery and Company Limited, manufacturers of aluminium venetian blinds, in the production, marketing and erection of the ceiling. A separate organization for this purpose is already in the course of establishment by Hurseal and Avery. It is expected to be fully operating early in 1959. In the meantime, key men are to be trained in manufacture and fixing under the direction of Mr. J. Fischer, B.Sc., M.Inst.C.E., the originator of the ceiling, in Copenhagen.

### Consultative Service

Just announced by **Eutectic Welding Alloys Company Ltd.** is a new free consultative service to welding users in British industry. Already tried and proved in Europe and the United States, Eutectic's weld savings application report service is stated to provide a speedy and comprehensive analysis of the time and material savings which should be operating in maintenance welding shops. It is also said to cover the hitherto "impossible" salvage and repair problems which can now be overcome with new low temperature welding techniques, using both oxy-acetylene and electric arc equipment. Full details of this service are available from the company.

### A Golf Meeting

A very pleasant dinner was held at the Welcombe Hotel, Stratford-on-Avon, on Wednesday of last week (October 1), attended by 30 members of the **National Association of Non-Ferrous Metal Merchants' Golfing Society.** On the following day some 20 members turned up at the Stratford-on-Avon Golf Club for the Autumn meeting of the society, but, unfortunately, the weather was so bad

and the rain so heavy that, after a very wet start, the bedraggled players abandoned the morning round.

The foursome competition in the afternoon for the Greensome Cup was won by Mr. G. Wolff, of Commercial Metal Company Ltd., partnered by Mr. S. W. Brown, of Litherland and Company (Metals) Ltd. The runners-up were Mr. G. Litherland, of Litherland and Company (Metals) Ltd., partnered by Mr. G. Tranter, of George E. Tranter Ltd.

**Metal Cleaning**

Our attention has been called to the advertisement on page 3 of last week's issue (3 October) of this journal. This advertisement referred to some of the activities of the **Electro-Chemical Engineering Company Ltd.,** but the address of the company was omitted. The company's head offices are, of course, at Forsyth Road, Sheerwater Industrial Estate, Woking, Surrey, and the telephone number Woking 5222-7.

**U.K. Metal Stocks**

Stocks of refined tin in London Metal Exchange official warehouses at the end of last week totalled 17,514 tons, comprising London 6,114, Liverpool 9,890, and Hull 1,510 tons. Copper stocks totalled 9,899 tons, and comprised London 5,499, Liverpool 4,125, Birmingham 75, Manchester 50 and Swansea 150.

**Tin Control in Canada**

News from Ottawa is to the effect that the Canadian Government has placed tin under import control as from October 1 last. The Acting Trade Minister announced that Canada would import tin only from countries in the Tin Agreement.

**Telephone Number Alteration**

It has been announced by **Wild-Barfield Electric Furnaces Limited,** of Watford, that their telephone number has been changed to Watford 26091.

**S.G. Iron Producers**

Following similar conferences, begun in Brussels in 1951 and held successively in Atlantic City, Paris, Florence, Birmingham, and Essen, the seventh **International Conference of S.G. Iron Producers** took place in Brussels on September 25 to 27 last, under the chairmanship of Mr. F. Dickinson, manager of the development and research department, The Mond Nickel Company Ltd.

Delegates to the conference numbered 175, representing 13 European countries, America and Africa. There were six technical sessions, during which Papers were presented on the following subjects: treatment, founding, processing, special S.G. irons, properties, testing and specifications, and applications. The technical discussions were followed by a showing of the Mond Nickel Company's new film, "Spheroidal Graphite Cast Iron."

**Forge Modernization**

During mid-September a conference, arranged by the **British Iron and Steel Research Association,** was held at Ashorne Hill, under the chairmanship of Mr. F. J. Somers, of Walter Somers Ltd. Over a hundred representatives from more than 40 member firms of the association were present.

Three Papers were presented for discussion:—(1) Building a new forge was the basis of the Paper from Mr. A. C. Lowe, of Thos. Firth and John Brown Ltd., who spoke about the rebuilding of that company's 1,750-ton press shop at their Atlas works; (2) features that make for a well-designed modern forge were dealt with in a Paper by Mr. E. Homer Kendall, of Kendall Contracting Inc., Ohio; and (3) a method for comparing alternative ways of forging was given by Mr. J. Banbury, of the B.I.S.R.A. Operational Research Department.

The discussion on these Papers was extremely lively, and latest developments were emphasized by the showing of a film of the B.I.S.R.A. experimental forge, in which the development of automatic forging is at an advanced stage. A further film by the English Steel Corporation bore witness to the wide range of processes and equipment required in forging

**Visiting Day**

On Saturday of last week, many relatives and friends of employees at the Witton works of **Imperial Chemical Industries Limited,** at Birmingham, visited the works, and were able to see much of the most up-to-date equipment for the processing of metals, and also the making of titanium ingots.

# Men and Metals

It has been announced by Johnson, Matthey and Company Limited that **Mr. Richard Turner** has been appointed a managing director of the company. Mr. Turner relinquishes his position of managing director of Mallory Metallurgical Products Limited, a subsidiary company, but remains a director.

Export manager of the Surform Division of Simmonds Aerocessories Ltd., **Mr. R. Goodburn** is visiting the company's agents and customers in Germany early in November. He will be accompanied by **Mr. P. W. Newby,** publicity manager of the Firth Cleveland group, of which Simmonds Aerocessories is a member.

At the annual general meeting of the British Welding Research Association, held recently, three new Council members were elected as follows:— **Dr. R. Beeching,** technical director, Imperial Chemical Industries Limited; **Mr. J. M. Willey,** director and general manager, Murex Welding Processes Limited; and **Mr. T. M. Herbert,** the director of research, British Railways Division of the British Transport Commission. **Mr. J. Strong,** President of the Institute of Welding and executive director of British Oxygen Gases Limited, will represent the Institute on the Association's Council during the year 1958-59.

With effect from Monday next, October 13, the manager of the Crompton Parkinson Cardiff branch, Plant Division, will be **Mr. C. E. Hucker.** Mr. Hucker joined the company in 1948, and since then has been employed as a sales engineer in the Bristol area.

It is announced that **Mr. C. A. Henderson** has been appointed general manager of **Eutectic Welding Alloys Limited.**

Development manager of the new department at Aston Chain and Hook Company Limited, described on page 318 of this issue, **Mr. Norman Harvey,** formerly the company's chief metallurgist, qualified for his M.Sc. degree after being seconded from the factory for a year whilst he took a full-time course in engineering production at the University of Birmingham.

Appointed assistant general manager of Head Wrightson Steel Foundries Limited, **Mr. George Taylor** commenced his apprenticeship with the company in 1932, and became works manager of the Stockton branch in June, 1956, at a time when extensive developments in plant and equipment were being undertaken. Mr. Taylor is a member of the Council of the Teesside branch of the Institute of British Foundrymen.

Previously a development engineer with the Dowty Group, **Mr. J. E. Twiss** has been appointed manager of the gravity die-casting foundry of Slough Metals Limited.

From British Timken Limited comes the announcement that **Mr. I. F. Fisher,** M.B.E., has been appointed general works manager, and will be responsible for the management of the company's factories at Duston and Daventry. Mr. Fisher's previous position as works manager at Duston is to be filled by **Mr. S. H. Jakeman,** assistant works manager at Duston.

## Forthcoming Meetings

**October 15—Institute of British Foundrymen.** Southampton Section. Technical College, St. Mary's Street, Southampton. "Die-Casting." H. J. Sharp. 7.30 p.m.

**October 15—Institute of Metal Finishing.** Organic Finishing Group. Exchange and Engineering Centre, Stephenson Place, Birmingham, 2. "Painting Marine Structures." F. Perkins. 6.30 p.m.

**October 15—Incorporated Plant Engineers.** Kent Branch. Kings Head Hotel, High Street, Rochester. "Ultrasonics in Industry." C. B. Abel-Harry. 7 p.m.

**October 16—The Birmingham Metallurgical Society.** Byng Kenrick Suite, College of Technology, Gosta Green, Birmingham, 4. "The Historical Development of the Rolling Mill." Eustace C. Larke. 6.30 p.m.

**October 16—Society of Instrument Technology.** East Midland Section. College of Technology and Commerce, The Newarke, Leicester. "Semi-Conductors and Their Applications." G. M. Ettinger. 6.30 p.m.

# Metal Market News

NOT for a long time past has the Metal Exchange displayed such strength as was seen last week, when every metal gained ground in a period of brisk trading. The upward movement was also seen in the United States where, on Thursday, copper, lead and zinc all advanced to a sizeable extent. Actually, lead made two upward moves during the week, first by ½ cent to 11½ cents on the last day of September, and again to 12 cents on October 2. The custom smelters put their price for copper up by 50 points to 27 cents, while zinc moved up by a similar amount to 10½ cents. For this, no doubt the introduction of a quota system is responsible, and in passing it may be mentioned that Mexico has decided to ban exports of both zinc and lead to the United States. Just why these two metals put up such a good show in London was presumably due to the strength in New York, for one might well suppose that shipments barred out of the United States market would find their way to London. After all, the import duties on lead and zinc are virtually nominal in the U.K., at any rate in comparison with those obtaining in the States. Stocks of copper in L.M.E. warehouses declined by 300 tons to 10,531 tons, and there is every indication that this downward trend, which has been going on for so many months, will continue. Tin stocks also fell, by 62 tons to 17,528 tons.

The copper market was, of course, influenced by the continuation of the two strikes, about which there was little news of a heartening nature until after hours on Friday, when word came through from Kitwe that the European Mineworkers' Union had agreed to fall in with the offer made by the companies that discussions should begin under an independent chairman. Nothing is certain, but there are hopes that a return to work will take place fairly soon. In the meanwhile, many thousands of tons of copper production have been lost. So far there is no word of any shortage at consumers' plants in this country, but the pinch may be felt later on, possibly in November. As already mentioned, the London market was active and the turnover in standard copper, apart from Kerb dealing, amounted to about 8,850 tons. On balance, cash gained £4 15s. 0d. and three months £4 10s. 0d., the close being £216 15s. 0d. cash and £216 10s. 0d. three months, and showing a backwardation of 5s. Since the market has been hovering on the brink of a premium on the cash position for a long time, this slightly sinister development did not occasion much surprise.

Sentiment about copper has now turned decidedly bullish, and the market is talked to a higher level, some observers crediting the producers with the intention to get the price up to 30 cents if at all possible. Consumers are not likely to be pleased at such a prospect, for competition from other and rival products is much in evidence and this can only be successfully met if the price of the metal is kept at a reasonable level. Many people regard this in the range £200 to £210. Although consumer buying of tin was not over-satisfactory, the market showed great strength and, on a turnover of 600 tons, put on £20 for cash to £745 and £24 for three months to £738. Both lead and zinc were firm, the former gaining £4 10s. 0d. to £73 15s. 0d. for prompt and £2 17s. 6d. to £73 12s. 6d. forward on a turnover of 6,600 tons. Some 8,500 tons of zinc changed hands with gains of £2 17s. 6d. and £2 in the respective positions, which closed at £67 12s. 6d. and £67 5s. 0d. prompt and forward. It will be noted that both these metals ended the week with backwardations.

### Birmingham

Conditions remain unchanged in the Midland metal-consuming industries. Output in many branches has been falling over the last few months. A great deal of overtime has been eliminated, stocks of raw material are being run down, exports are falling, and the maximum productive capacity of many works is not being used. The motor trade continues active, however, and suppliers of components can look forward to steady employment for some months at least, particularly as the car manufacturers have booked some very valuable orders recently. Non-ferrous tube makers are fairly busy on work for the power stations, both electric and nuclear, that are being erected in this country and abroad.

Owing to slackness of trade, over 200 men were recently dismissed from one of the biggest steel works in the Midlands. The reason given was that it was necessary to eliminate all weekend working in the two melting shops. This is indicative of the position in the steel trade. Customers are ordering sparingly, and quite obviously take the view that in the present circumstances of more speedy delivery there is no point in buying on a long-term basis. Sheet mills continue active on work for the motor trade, and there is a steady demand for plates for tank and boiler makers.

### French Guinea

Guinea's decision to choose independence outside the French Union has caused a sharp decline in share values on the Paris Bourse of French firms with interests in the territory. The main companies affected by the changed political conditions for investment are two international groups which are planning to mine Guinea's rich bauxite deposits and produce alumina on the spot. The most heavily committed of the two groups is an international consortium called "Fria," which has already spent some 20,000 million francs out of a planned investment of 56,000 million in the territory.

The target is the construction in central Guinea of an alumina plant with an annual capacity of 480,000 tons, designed to permit later expansion to over one million tons. A 150 km railway linking Fria to the port of Conakry is being built, and shipments are due to start in 1960. Headed by the French aluminium producers Pechiney and Ugine, Fria brings together American (Olin-Mathieson), British (British Aluminium Co.) and Swiss (Aluminium Industrie Aktiengesellschaft) producers.

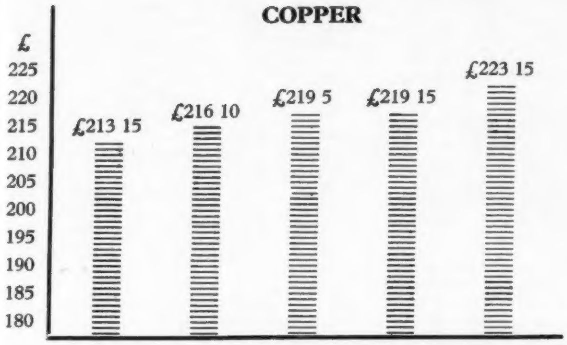
Industry sources in Paris consider it highly unlikely that Guinea's independence will affect Fria's plans. They report that investments already made are too important for the group to consider suspending operations. In any case, they point out, European aluminium producers would find it difficult to secure an alternative source of bauxite for their expanding production over the coming years. The group is expected to negotiate new contractual agreements with the Republic of Guinea in due course. The same sources report that the case of the second group working in Guinea is less clear-cut. This is Bauxites du Midi, French subsidiary of Alcan, which is building an alumina plant at Boke, in Northern Guinea, to have an initial production capacity of 220,000 tons per year. It is understood that investment expenditure to date totals some seven million dollars.

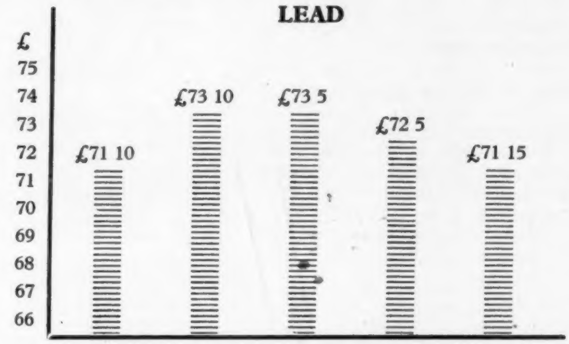
Usually reliable sources suggest that Alcan may consider slowing down its Guinea development plans until the political situation there is clearer. Alcan may be influenced to make such a decision by the weak world market for aluminium at present, and by the recent substantial bauxite finds which have been made in Australia, these sources add.

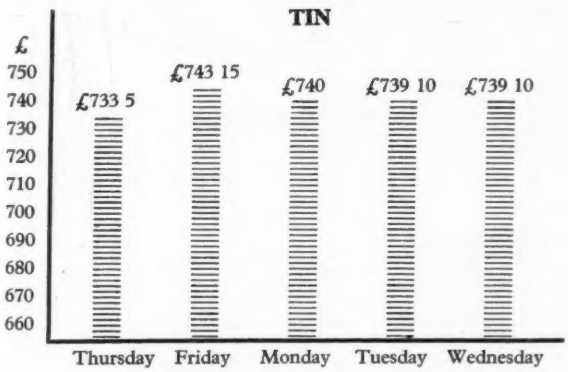
Independence for Guinea may cause a setback to plans to build a hydro-electric dam on the Konkoure River, and produce aluminium in the territory from local alumina. It has been estimated that the dam would take six to seven years to build and provide current for an aluminium plant with an annual capacity amounting to 150,000 tons.

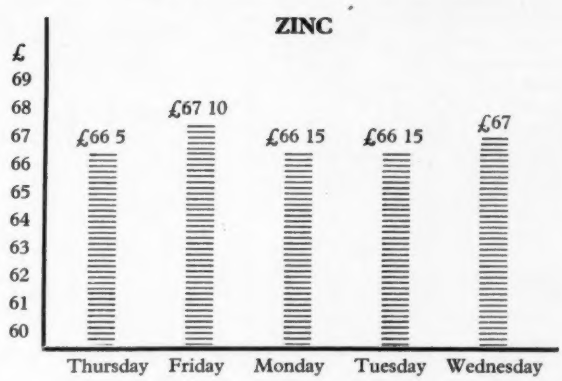
# METAL PRICE CHANGES

LONDON METAL EXCHANGE, Thursday 2 October 1958 to Wednesday 8 October 1958




# OVERSEAS PRICES

Latest available quotations for non-ferrous metals with approximate sterling equivalents based on current exchange rates

| | Belgium fr/kg ≏ £/ton | | Canada c/lb ≏ £/ton | | France fr/kg ≏ £/ton | | Italy lire/kg ≏ £/ton | | Switzerland fr/kg ≏ £/ton | | United States c/lb ≏ £/ton | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Aluminium** | | | 22.50 | 185 17 6 | 210 | 182 15 | 375 | 217 10 | | | 26.80 | 214 10 |
| **Antimony** 99.0 | | | | | 195 | 169 12 6 | 420 | 243 12 6 | | | 29.00 | 232 0 |
| **Cadmium** | | | | | 1,500 | 1,305 0 | | | | | 145.00 | 1,160 0 |
| **Copper** | | | | | | | | | | | | |
| Crude | | | | | | | | | | | | |
| Wire bars 99.9 | | | | | | | 425 | 246 10 | | | | |
| Electrolytic | 30.90 | 225 17 6 | 25.75 | 212 12 6 | 266 | 234 0 | | | 2.67 | 223 5 | 26.50 | 212 0 |
| **Lead** | | | 10.75 | 88 15 | 110 | 95 15 | 176 | 102 0 | .89 | 76 10 | 12.00 | 96 0 |
| **Magnesium** | | | | | | | | | | | | |
| **Nickel** | | | 70.00 | 578 5 | 1,205 | 1,048 7 6 | 1,300 | 754 0 | 7.56 | 632 2 6 | 74.00 | 592 0 |
| **Tin** | 103.25 | 754 15 | | | 910 | 791 15 | 1,400 | 812 0 | 8.60 | 719 2 6 | 96.87 | 775 0 |
| **Zinc** | | | | | | | | | | | | |
| Prime western | | | 10.25 | 84 12 6 | | | | | | | 10.50 | 84 0 |
| High grade 99.95 | | | 10.85 | 89 10 0 | | | | | | | | |
| High grade 99.99 | | | 11.25 | 92 5 | | | | | | | | |
| Thermic | | | | | 107.12 | 93 2 6 | | | | | | |
| Electrolytic | | | | | 115.12 | 100 2 6 | 162 | 94 0 | .88 | 73 10 | 11.75 | 94 0 |

# NON-FERROUS METAL PRICES

(All prices quoted are those available at 12 noon 8/10/58)

## PRIMARY METALS

| | | £ | s. | d. |
|---|---|---|---|---|
| **Aluminium** Ingots.... | ton | 180 | 0 | 0 |
| **Antimony** 99·6% .... | ,, | 197 | 0 | 0 |
| **Antimony** Metal 99%.. | ,, | 190 | 0 | 0 |
| **Antimony** Oxide...... | ,, | 180 | 0 | 0 |
| **Antimony** Sulphide Lump.............. | ,, | 190 | 0 | 0 |
| **Antimony** Sulphide Black Powder........ | ,, | 205 | 0 | 0 |
| **Arsenic**.............. | ,, | 400 | 0 | 0 |
| **Bismuth** 99·95%...... | lb. | | 16 | 0 |
| **Cadmium** 99·9% ...... | ,, | | 9 | 6 |
| **Calcium** ............ | ,, | 2 | 0 | 0 |
| **Cerium** 99% ........ | ,, | 16 | 0 | 0 |
| **Chromium** .......... | ,, | | 6 | 11 |
| **Cobalt** .............. | ,, | | 16 | 0 |
| **Columbite**.... per unit | | | — | |
| **Copper** H.C. Electro.. | ton | 223 | 15 | 0 |
| Fire Refined 99·70% | ,, | 222 | 0 | 0 |
| Fire Refined 99·50% | ,, | 221 | 0 | 0 |
| **Copper Sulphate** .... | ,, | 72 | 10 | 0 |
| **Germanium** ........ | grm. | | — | |
| **Gold** ................ | oz. | 12 | 10 | 3½ |
| **Indium** .............. | ,, | | 10 | 0 |
| **Iridium**.............. | ,, | 20 | 0 | 0 |
| **Lanthanum**.......... | grm. | | 15 | 0 |
| **Lead** English.......... | ton | 71 | 15 | 0 |
| **Magnesium** Ingots.... | lb. | | 2 | 5½ |
| Notched Bar ........ | ,, | | 2 | 10½ |
| Powder Grade 4...... | ,, | | 6 | 3 |
| Alloy Ingot, A8 or AZ91 | ,, | | 2 | 8 |
| **Manganese Metal**.... | ton | 290 | 0 | 0 |
| **Mercury** ............ | flask | 79 | 0 | 0 |
| **Molybdenum** ........ | lb. | 1 | 10 | 0 |
| **Nickel** .............. | ton | 600 | 0 | 0 |
| F. Shot ............ | lb. | | 5 | 5 |
| F. Ingot ............ | ,, | | 5 | 6 |
| **Osmium** ............ | oz. | | nom. | |
| **Osmiridium** ........ | ,, | | nom. | |
| **Palladium** .......... | ,, | 5 | 15 | 0 |
| **Platinum**............ | ,, | 21 | 5 | 0 |
| **Rhodium** ............ | ,, | 40 | 0 | 0 |
| **Ruthenium** .......... | ,, | 15 | 0 | 0 |
| **Selenium** ............ | lb. | | nom. | |
| **Silicon** 98%.......... | ton | | nom. | |
| **Silver** Spot Bars...... | oz. | | 6 | 5⅛ |
| **Tellurium** .......... | lb. | | 15 | 0 |
| **Tin**.................. | ton | 739 | 10 | 0 |
| ***Zinc** | | | | |
| Electrolytic.......... | ton | | — | |
| Min 99·99% ........ | ,, | | — | |
| Virgin Min 98% .... | ,, | 66 | 12 | 6 |
| Dust 95/97%........ | ,, | 104 | 0 | 0 |
| Dust 98/99%........ | ,, | 110 | 0 | 0 |
| Granulated 99+% .. | ,, | 91 | 12 | 6 |
| Granulated 99·99+% | ,, | 104 | 17 | 6 |

**Duty and Carriage to customers' works for buyers' account.*

## INGOT METALS

| Aluminium Alloy (Virgin) | | £ | s. | d. |
|---|---|---|---|---|
| B.S. 1490 L.M.5 .... | ton | 210 | 0 | 0 |
| B.S. 1490 L.M.6 .... | ,, | 202 | 0 | 0 |
| B.S. 1490 L.M.7 .... | ,, | 216 | 0 | 0 |
| B.S. 1490 L.M.8 .... | ,, | 203 | 0 | 0 |
| B.S. 1490 L.M.9 .... | ,, | 203 | 0 | 0 |
| B.S. 1490 L.M.10.... | ,, | 221 | 0 | 0 |
| B.S. 1490 L.M.11.... | ,, | 215 | 0 | 0 |
| B.S. 1490 L.M.12.... | ,, | 223 | 0 | 0 |
| B.S. 1490 L.M.13.... | ,, | 216 | 0 | 0 |
| B.S. 1490 L.M.14.... | ,, | 224 | 0 | 0 |
| B.S. 1490 L.M.15.... | ,, | 210 | 0 | 0 |
| B.S. 1490 L.M.16.... | ,, | 206 | 0 | 0 |
| B.S. 1490 L.M.18.... | ,, | 203 | 0 | 0 |
| B.S. 1490 L.M.22.... | ,, | 210 | 0 | 0 |

| †Aluminium Alloys (Secondary) | | £ | s. | d. |
|---|---|---|---|---|
| B.S. 1490 L.M.1 .... | ton | 144 | 0 | 0 |
| B.S. 1490 L.M.2 .... | ,, | 152 | 0 | 0 |
| B.S. 1490 L.M.4 .... | ,, | 169 | 0 | 0 |
| B.S. 1490 L.M.6 .... | ,, | 187 | 0 | 0 |

†Average selling prices for mid September

| | | £ | s. | d. |
|---|---|---|---|---|
| ***Aluminium Bronze** | | | | |
| BSS 1400 AB.1...... | ton | 207 | 0 | 0 |
| BSS 1400 AB.2...... | ,, | 223 | 0 | 0 |
| ***Brass** | | | | |
| BSS 1400-B3 65/35 .. | ,, | 142 | 0 | 0 |
| BSS 249............ | ,, | | — | |
| BSS 1400-B6 85/15 .. | ,, | 185 | 0 | 0 |
| ***Gunmetal** | | | | |
| R.C.H. 3/4% ton .... | ,, | | — | |
| (85/5/5/5) .......... | ,, | 175 | 0 | 0 |
| (86/7/5/2) .......... | ,, | 185 | 0 | 0 |
| (88/10/2/1).......... | ,, | 234 | 0 | 0 |
| (88/10/2/½).......... | ,, | 243 | 0 | 0 |
| **Manganese Bronze** | | | | |
| BSS 1400 HTB1.... | ,, | 177 | 0 | 0 |
| BSS 1400 HTB2.... | ,, | | — | |
| BSS 1400 HTB3.... | ,, | | — | |
| **Nickel Silver** | | | | |
| Casting Quality 12% | ,, | | nom. | |
| ,, ,, 16% | ,, | | nom. | |
| ,, ,, 18% | ,, | | nom. | |
| ***Phosphor Bronze** | | | | |
| B.S. 1400 P.B.1 (A.I.D. released) .......... | ,, | 258 | 0 | 0 |
| B.S. 1400 L.P.B.1.... | ,, | 193 | 0 | 0 |
| **Phosphor Copper** | | | | |
| 10% .............. | ,, | 230 | 0 | 0 |
| 15% .............. | ,, | 235 | 0 | 0 |

**Average prices for the last week-end.*

| | | £ | s. | d. |
|---|---|---|---|---|
| **Phosphor Tin** | | | | |
| 5% ................ | ton | | — | |
| **Silicon Bronze** | | | | |
| BSS 1400-SB1 ........ | ,, | | — | |
| **Solder,** soft, BSS 219 | | | | |
| Grade C Tinmans .. | ,, | 352 | 10 | 0 |
| Grade D Plumbers.. | ,, | 285 | 0 | 0 |
| Grade M .......... | ,, | 386 | 0 | 0 |
| **Solder,** Brazing, BSS 1845 | | | | |
| Type 8 (Granulated) | lb. | | — | |
| Type 9 ,, | ,, | | — | |
| **Zinc Alloys** | | | | |
| Mazak III .......... | ton | 98 | 2 | 6 |
| Mazak V .......... | ,, | 102 | 2 | 6 |
| Kayem ............ | ,, | 108 | 2 | 6 |
| Kayem II .......... | ,, | 114 | 2 | 6 |
| Sodium-Zinc........ | lb. | | 2 | 5½ |

## SEMI-FABRICATED PRODUCTS

Prices of all semi-fabricated products vary according to dimensions and quantities. The following are the basis prices for certain specific products.

| Aluminium | | £ | s. | d. |
|---|---|---|---|---|
| Sheet 10 S.W.G. | lb. | | 2 | 8 |
| Sheet 18 S.W.G. | ,, | | 2 | 10 |
| Sheet 24 S.W.G. | ,, | | 3 | 1 |
| Strip 10 S.W.G. | ,, | | 2 | 8 |
| Strip 18 S.W.G. | ,, | | 2 | 9 |
| Strip 24 S.W.G. | ,, | | 2 | 10½ |
| Circles 22 S.W.G. | ,, | | 3 | 2 |
| Circles 18 S.W.G. | ,, | | 3 | 1 |
| Circles 12 S.W.G. | ,, | | 3 | 0 |
| Plate as rolled ...... | ,, | | 2 | 7½ |
| Sections ............ | ,, | | 3 | 1½ |
| Wire 10 S.W.G. .... | ,, | | 2 | 11 |
| Tubes 1 in. o.d. 16 S.W.G. .......... | ,, | | 4 | 0 |

| Aluminium Alloys | | £ | s. | d. |
|---|---|---|---|---|
| BS1470. HS10W. | lb. | | | |
| Sheet 10 S.W.G. | ,, | | 3 | 0½ |
| Sheet 18 S.W.G. | ,, | | 3 | 3 |
| Sheet 24 S.W.G. | ,, | | 3 | 10½ |
| Strip 10 S.W.G. | ,, | | 3 | 0½ |
| Strip 18 S.W.G. | ,, | | 3 | 2 |
| Strip 24 S.W.G. | ,, | | 3 | 10 |
| BS1477. HP30M. | | | | |
| Plate as rolled...... | ,, | | 2 | 10½ |
| BS1470. HC15WP. | | | | |
| Sheet 10 S.W.G. | ,, | | 3 | 6½ |
| Sheet 18 S.W.G. | ,, | | 4 | 0½ |
| Sheet 24 S.W.G. | ,, | | 4 | 10½ |
| Strip 10 S.W.G. | ,, | | 3 | 9½ |
| Strip 18 S.W.G. | ,, | | 4 | 0½ |
| Strip 24 S.W.G. | ,, | | 4 | 8 |
| BS1477. HPC15WP. | | | | |
| Plate heat treated.... | ,, | | 3 | 5½ |
| BS1475. HG10W. | | | | |
| Wire 10 S.W.G. | ,, | | 3 | 9½ |
| BS1471. HT10WP. | | | | |
| Tubes 1 in. o.d. 16 S.W.G. .......... | ,, | | 4 | 11 |
| BS1476. HE10WP. | | | | |
| Sections .......... | ,, | | 3 | 1 |
| **Beryllium Copper** | | | | |
| Strip .............. | ,, | 1 | 4 | 11 |
| Rod................ | ,, | 1 | 1 | 6 |
| Wire .............. | ,, | 1 | 4 | 9 |
| **Brass** Tubes.......... | ,, | | 1 | 8⅞ |
| Brazed Tubes........ | ,, | | — | |
| Drawn Strip Sections | ,, | | — | |
| Sheet .............. | ton | | — | |
| Strip .............. | ,, | 236 | 10 | 0 |
| Extruded Bar........ | lb. | | 1 | 10⅜ |
| Extruded Bar (Pure Metal Basis) ...... | ,, | | — | |
| Condenser Plate (Yellow Metal) ........ | ton | 173 | 0 | 0 |
| Condenser Plate (Naval Brass) ........ | ,, | 184 | 0 | 0 |
| Wire .............. | lb. | | 2 | 6⅜ |
| **Copper** Tubes........ | lb. | | 2 | 1¾ |
| Sheet .............. | ton | 250 | 10 | 0 |
| Strip .............. | ,, | 250 | 10 | 0 |
| Plain Plates ........ | ,, | | — | |
| Locomotive Rods .... | ,, | | — | |
| H.C. Wire .......... | ,, | 266 | 15 | 0 |
| **Cupro Nickel** | | | | |
| Tubes 70/30 ........ | lb. | | 3 | 5⅜ |
| **Lead** Pipes (London) .. | ton | 113 | 15 | 0 |
| Sheets (London) .... | ,, | 111 | 10 | 0 |
| Tellurium Lead .... | ,, | £6 extra | | |
| **Nickel Silver** | | | | |
| Sheet and Strip 7% .. | lb. | | 3 | 5¼ |
| Wire 10% .......... | ,, | | 3 | 11¾ |
| **Phosphor Bronze** | | | | |
| Wire .............. | ,, | | 3 | 10¼ |

| **Titanium** (1,000 lb. lots) | | | |
|---|---|---|---|
| Billet over 4″ dia.-18″ dia. | lb. | 63/- | 64/- |
| Rod 4″ dia.-·250″ dia. | ,, | 75/- | 112/- |
| Wire under ·250″ dia.-·036″ dia. .......... | ,, | 146/- | 222/- |
| Sheet 8′ × 2′ × ·250″-·010″ thick .............. | ,, | 88/- | 157/- |
| Strip ·048″-·003″ thick | ,, | 100/- | 350/- |
| Tube (representative gauge) ............ | ,, | | 300/- |
| Extrusions .......... | ,, | | 120/- |

| | | £ | s. | d. |
|---|---|---|---|---|
| **Zinc** Sheets, English destinations ...... | ton | 100 | 15 | 0 |
| Strip .............. | ,, | | nom. | |

# Financial News

## Light Metal Statistics

Figures showing the U.K. production, etc., of light metals for July, 1958, have been issued by the Ministry of Supply as follow (in long tons):—

| | |
|---|---|
| **Virgin Aluminium** | |
| Production | 1,735 |
| Imports | 9,598 |
| Despatches to consumers | 15,406 |
| **Secondary Aluminium** | |
| Production | 8,661 |
| Virgin content of above | 705 |
| Despatches (including virgin content) | 8,204 |
| **Secondary in Consumption** (per cent) | |
| Wrought products | 7·2 |
| Cast products | 85·8 |
| Destructive uses (aluminium content irrecoverable) | 71·2 |
| Total consumption | 29·6 |
| **Scrap** | |
| Arisings | 11,977 |
| Estimated quantity of metal recoverable | 8,608 |
| Consumption by: | |
| (a) Secondary smelters | 10,801 |
| (b) Other users | 1,120 |
| **Despatches of wrought and cast products** | |
| Sheet, strip and circles | 10,154 |
| Extrusions (excluding forging bar, wire-drawing rod and tube shell): | |
| (a) Bars and sections | 2,639 |
| (b) Tubes (i) extruded | 168 |
| (ii) cold drawn | 446 |
| (c) (i) Wire | 1,761 |
| (ii) Hot rolled rod (not included in (c) (i)) | 154 |
| Forgings | 251 |
| Castings: (a) Sand | 1,408 |
| (b) Gravity die | 3,288 |
| (c) Pressure die | 1,280 |
| **Foil** | 1,918 |
| **Paste** | 359 |
| **Magnesium Fabrication** | |
| Sheet and strip | 9 |
| Extrusions | 40 |
| Castings | 153 |
| Forgings | 10 |

**LIGHT METALS STATISTICS IN JAPAN**
**(June, 1958)**

| Classification | Production | Shipment | Stock | Export |
|---|---|---|---|---|
| **Alumina** | 18,403 | 15,036 | 14,887 | 0 |
| **Aluminium** | | | | |
| Primary | 7,428 | 7,841 | 1,942 | 521 |
| Secondary | 1,759 | 1,776 | 387 | 0 |
| Rolled Products | 5,800 | 5,722 | 1,693 | 482 |
| Electric Wire | 720 | 617 | 1,056 | 3 |
| Sheet Products | 1,365 | 1,273 | 1,049 | 0 |
| Castings | 1,549 | — | — | — |
| Die-Castings | 903 | — | — | — |
| Forgings | 17 | — | — | — |
| Powder | — | — | — | — |
| **Primary Aluminium** (July) | 6,828 | 6,910 | 1,860 | 355 |
| **Sponge Titanium** | 132 | 122 | 788 | 114 |
| **Magnesium** | 85 | 81 | 5 | — |
| Secondary | 185 | 172 | 282 | 0 |

**E. Chalmers and Co.**

Ordinary dividend 7½ per cent, making 12½ per cent (same) for the year to August 31, 1958. Consolidated net profit before tax £34,081 (£33,568). Tax £17,150 (£22,050). Unrequired tax £391 (£1,855). Forward £66,139 (£65,377).

# New Companies

The particulars of companies recently registered are quoted from the daily register compiled by Jordan and Sons Limited, Company Registration Agents, Chancery Lane, W.C.2.

**Salvage and Recovery (Metals and Plastics) Limited** (610370), 101 Hatton Garden, E.C.1. Registered August 28, 1958. Nominal capital, £1,000 in £1 shares. Director: Lawrence R. Nicholson.

**Blackpool Metal Products Limited** (610376), 23a Clifton Street, Blackpool. Registered August 28, 1958. To carry on business of mechanical engineers, etc. Nominal capital, £100 in £1 shares. Directors: Thomas M. Nutbrown, John W. Bostock and Mrs. Muriel G. G. Hale.

**Star Metal Stamping Company Limited** (610395), Star Works, Brook Street, Bilston, Staffs. Registered August 28, 1958. Nominal capital, £100 in £1 shares. Directors: John L. Burden, Douglas A. Cross and Wm. V. S. Sinclair.

**C. A. and G. Forster and Sons Limited** (610401), Armada Works, Wellington Street, Sheffield, 1. Registered August 28, 1958. To carry on business of electro, chromium, nickel and metal platers, polishers and finishers, etc. Nominal capital, £1,000 in £1 shares. Directors: Charles A. Forster and Grace Forster.

**J. and J. Gilham Limited** (610861), Trafalgar Foundry, Leeds, 11. Registered September 5, 1958. To carry on the business of brass, bronze and other metal founders, etc. Nominal capital, £1,500 in £1 shares. Directors: Cyril P. Hull and Joyce M. Hull.

**Celnik and Power (Sales) Ltd.** (611106), Stannard Road, Dalston, E.8. Registered September 11, 1958. To carry on the business of dealers in aluminium and other metals, and alloy tableware, cutlery, etc. Nominal capital, £1,000 in £1 shares (500 "A" and 500 "B"). Directors: Zalma Celnik, Vera M. Power, Rose Celnik, John S. Power, Albert Celnik, Valerie J. Power, Brian E. Power and Betty Celnik

**G.L.R. Engineering Company Limited** (611176), 106 High Street, Southend-on-Sea. Registered September 12, 1958. To carry on business of pipe and general welders, etc. Nominal capital, £1,000 in £1 shares. Directors: M. Levene and W. A. Geary.

# Scrap Metal Prices

Merchants' average buying prices delivered, per ton, 7/10/58.

| | £ |
|---|---|
| **Aluminium** | |
| New Cuttings | 134 |
| Old Rolled | 110 |
| Segregated Turnings | 90 |
| **Brass** | |
| Cuttings | 133 |
| Rod Ends | 129 |
| Heavy Yellow | 113 |
| Light | 108 |
| Rolled | 125 |
| Collected Scrap | 109 |
| Turnings | 123 |
| **Copper** | |
| Wire | 187 |
| Firebox, cut up | 184 |
| Heavy | 178 |
| Light | 173 |
| Cuttings | 187 |
| Turnings | 169 |
| Braziery | 149 |

| | £ |
|---|---|
| **Gunmetal** | |
| Gear Wheels | 176 |
| Admiralty | 176 |
| Commercial | 150 |
| Turnings | 145 |
| **Lead** | |
| Scrap | 63 |
| **Nickel** | |
| Cuttings | — |
| Anodes | 440 |
| **Phosphor Bronze** | |
| Scrap | 150 |
| Turnings | 145 |
| **Zinc** | |
| Remelted | 54 |
| Cuttings | 41 |
| Old Zinc | 28 |

The latest available scrap prices quoted on foreign markets are as follow. (The figures in brackets give the English equivalents in £1 per ton):—

| | | |
|---|---|---|
| **West Germany** (D-marks per 100 kilos): | | |
| Used copper wire | (£182.15.0) | 210 |
| Heavy copper | (£178.7.6) | 205 |
| Light copper | (£146.2.6) | 168 |
| Heavy brass | (£111.7.6) | 128 |
| Light brass | (£87.0.0) | 100 |
| Soft lead scrap | (£61.0.0) | 70 |
| Zinc scrap | (£34.17.6) | 40 |
| Used aluminium unsorted | (£87.0.0) | 100 |
| **France** (francs per kilo): | | |
| Copper | (£208.17.6) | 240 |
| Heavy copper | (£208.17.6) | 240 |
| Light brass | (£143.10.0) | 165 |
| Zinc castings | (£65.5.0) | 75 |
| Lead | (£82.12.6) | 95 |
| Tin | — | |
| Aluminium | (£117.10.0) | 135 |

| | | |
|---|---|---|
| **Italy** (lire per kilo): | | |
| Aluminium soft sheet clippings (new) | (£191.10.0) | 330 |
| Aluminium copper alloy | (£119.0.0) | 205 |
| Lead, soft, first quality | (£84.12.6) | 146 |
| Lead, battery plates | (£49.17.6) | 86 |
| Copper, first grade | (£194.7.6) | 335 |
| Copper, second grade | (£179.17.6) | 310 |
| Bronze, first quality machinery | (£188.10.0) | 325 |
| Bronze, commercial gunmetal | (£159.10.0) | 275 |
| Brass, heavy | (£130.10.0) | 225 |
| Brass, light | (£119.0.0) | 205 |
| Brass, bar turnings | (£127.12.6) | 220 |
| New zinc sheet clippings | (£55.2.6) | 95 |
| Old zinc | (£40.12.6) | 70 |

# THE STOCK EXCHANGE

## *Strong And Active Markets. Tubes Reached 70/- On Results And Higher Dividend*

| ISSUED CAPITAL • | AMOUNT OF SHARE | NAME OF COMPANY | MIDDLE PRICE 7 OCTOBER +RISE —FALL | DIV. FOR LAST FIN. YEAR | DIV. FOR PREV. YEAR | DIV. YIELD | 1958 HIGH | 1958 LOW | 1957 HIGH | 1957 LOW |
|---|---|---|---|---|---|---|---|---|---|---|
| £ | £ | | | Per cent | Per cent | | | | | |
| 4,435,792 | 1 | Amalgamated Metal Corporation ... | 21/9 | 9 | 10 | 8 5 6 | 21/9 | 17/6 | 28/3 | 18/- |
| 400,000 | 2/- | Anti-Attrition Metal ... ... ... | 1/6 | 4 | 8½ | 5 6 9 | 1/6 | 1/3 | 2/6 | 1/6 |
| 33,639,483 | Stk. (£1) | Associated Electrical Industries ... | 52/9 —6d. | 15 | 15 | 5 13 9 | 53/9 | 46/6 | 72/3 | 47/9 |
| 1,590,000 | 1 | Birfield Industries ... ... ... | 60/6 +3d. | 15 | 15 | 4 19 3 | 60/6 | 46/3 | 70/- | 48/9 |
| 3,196,667 | 1 | Birmid Industries ... ... ... | 72/- —1/9 | 17½ | 17½ | 4 17 3 | 76/3 | 55/3 | 80/6 | 55/9 |
| 5,630,344 | Stk. (£1) | Birmingham Small Arms ... ... | 31/9 | 10 | 8 | 6 6 0 | 32/3 | 23/9 | 33/- | 21/9 |
| 203,150 | Stk. (£1) | Ditto Cum. A. Pref. 5% ... ... | 15/10½xd | 5 | 5 | 6 6 0 | 16/1½ | 14/7½ | 16/- | 15/- |
| 350,580 | Stk. (£1) | Ditto Cum. B. Pref. 6% ... ... | 17/1½xd | 6 | 6 | 7 0 3 | 17/4½ | 16/6 | 19/- | 16/6 |
| 500,000 | 1 | Bolton (Thos.) & Sons ... ... | 26/3 | 12½ | 12½ | 9 10 6 | 28/9 | 24/- | 30/3 | 28/9 |
| 300,000 | 1 | Ditto Pref. 5% ... ... ... | 15/- | 5 | 5 | 6 13 3 | 16/- | 15/- | 16/9 | 14/3 |
| 160,000 | 1 | Booth (James) & Co. Cum. Pref. 7% | 20/- | 7 | 7 | 7 0 0 | 19/4½ | 19/- | 22/3 | 18/9 |
| 9,000,000 | Stk. (£1) | British Aluminium Co. ... ... | 48/-xd +1½d. | 12 | 12 | 5 0 0 | 54/9 | 36/6 | 72/- | 38/3 |
| 1,500,000 | Stk. (£1) | Ditto Pref. 6% ... ... ... | 19/3 | 6 | 6 | 6 4 9 | 19/3 | 18/4½ | 21/6 | 18/- |
| 15,000,000 | Stk. (£1) | British Insulated Callender's Cables | 45/9 —1/- | 12½ | 12½ | 5 9 3 | 46/9 | 38/9 | 55/- | 40/- |
| 17,047,166 | Stk. (£1) | British Oxygen Co. Ltd., Ord. ... | 40/3 +6d. | 10 | 10 | 4 19 6 | 40/3 | 29/- | 39/- | 29/6 |
| 600,000 | Stk. (5/-) | Canning (W.) & Co. ... ... ... | 23/4½ +7½d. | 25+ *2½C | 25 | 5 7 0 | 23/4½ | 19/7½ | 24/6 | 19/3 |
| 60,484 | 1/- | Carr (Chas.) ... ... ... ... | 1/10½ | 25 | 25 | 9 6 9X | 2/3 | 1/4½ | 3/6 | 2/1½ |
| 150,000 | 2/- | Case (Alfred) & Co. Ltd. ... ... | 4/6 +3d. | 25 | 25 | 11 2 3 | 4/9 | 4/- | 4/6 | 4/- |
| 555,000 | 1 | Clifford (Chas.) Ltd. ... ... ... | 19/9 | 10 | 10 | 10 2 6 | 20/- | 16/- | 20/6 | 15/9 |
| 45,000 | 1 | Ditto Cum. Pref. 6% ... ... | 15/6 | 6 | 6 | 7 14 9 | 15/10½ | 15/7½ | 17/6 | 16/- |
| 250,000 | 2/- | Coley Metals ... ... ... ... | 3/3 | 20 | 25 | 12 6 3 | 4/6 | 2/6 | 5/7½ | 3/9 |
| 8,730,596 | 1 | Cons. Zinc Corp.† ... ... ... | 53/6 +4/9 | 18¾ | 22½ | 7 0 3 | 53/6 | 41/- | 92/6 | 49/- |
| 1,136,233 | 1 | Davy & United ... ... ... | 72/6 +3/3 | 20 | 15 | 5 10 3 | 72/6 | 45/9 | 60/6 | 42/6 |
| 2,750,000 | 5/- | Delta Metal ... ... ... ... | 23/6 +9d. | 30 | *17½ | 6 7 9 | 23/6 | 17/7½ | 28/6 | 19/- |
| 4,160,000 | Stk. (£1) | Enfield Rolling Mills Ltd. ... ... | 36/6 +6d. | 12½ | 15B | 6 17 0 | 36/6 | 22/9 | 38/6 | 25/- |
| 750,000 | 1 | Evered & Co. ... ... ... ... | 27/1½xd | 15Z | 15 | 7 7 6 | 28/3 | 26/- | 52/9 | 42/- |
| 18,000,000 | Stk. (£1) | General Electric Co. ... ... ... | 38/3 +9d. | 10 | 12½ | 5 4 6 | 38/7½ | 29/6 | 59/- | 38/- |
| 1,500,000 | Stk. (10/-) | General Refractories Ltd. ... ... | 36/9 —9d. | 20 | 17½ | 5 8 9 | 37/6 | 27/3 | 37/- | 26/9 |
| 401,240 | 1 | Gibbons (Dudley) Ltd. ... ... | 62/6 | 15 | 15 | 4 16 0 | 66/3 | 61/- | 71/- | 53/- |
| 750,000 | 5/- | Glacier Metal Co. Ltd. ... ... | 7/6 | 11½ | 11½ | 7 13 3 | 7/6 | 5/6 | 8/1½ | 5/10½ |
| 1,750,000 | 5/- | Glynwed Tubes ... ... ... | 17/6 +3d. | 20 | 20 | 5 14 3 | 17/6 | 12/10½ | 18/- | 12/6 |
| 5,421,049 | 10/- | Goodlass Wall & Lead Industries ... | 26/3xd +3d. | 13‖ | 18Z | 4 19 0 | 25/9 | 19/3 | 37/3 | 28/9 |
| 342,195 | 1 | Greenwood & Batley ... ... | 50/6 | 20 | 17½ | 7 18 6 | 50/6 | 45/- | 50/- | 46/- |
| 396,000 | 5/- | Harrison (B'ham) Ord. ... ... | 15/3 +6d. | *15 | *15 | 4 18 6 | 15/3 | 11/6 | 16/9 | 12/4½ |
| 150,000 | 1 | Ditto Cum. Pref. 7% ... ... | 19/- | 7 | 7 | 7 7 3 | 19/- | 18/9 | 22/3 | 18/7½ |
| 1,075,167 | 5/- | Heenan Group ... ... ... | 8/10½ +3d. | 10 | 20‡ | 5 12 9 | 8/10½ | 6/9 | 10/4½ | 6/9 |
| 216,531,615 | Stk. (£1) | Imperial Chemical Industries ... | 34/3xd +7½d. | 12Z | 10 | 4 13 6 | 34/6 | 27/7½ | 46/6 | 36/3 |
| 33,708,769 | Stk. (£1) | Ditto Cum. Pref. 5% ... ... | 17/- | 5 | 5 | 5 17 9 | 17/1½ | 16/- | 18/6 | 15/6 |
| 14,584,025 | ** | International Nickel ... ... ... | 158 +6½ | $3.75 | $3.75 | 4 2 0 | 158 | 132¾ | 222 | 130 |
| 430,000 | 5/- | Jenks (E. P.), Ltd. ... ... ... | 8/6 +3d. | 27½ϕ | 27½ | 8 1 9 | 8/6 | 6/9 | 18/10½ | 15/1½ |
| 300,000 | 1 | Johnson, Matthey & Co. Cum. Pref. 5% | 16/3 | 5 | 5 | 6 3 0 | 16/9 | 15/- | 17/- | 14/6 |
| 3,987,435 | 1 | Ditto Ord. ... ... ... ... | 42/- +3d. | 10 | 10 | 4 15 3 | 45/3 | 36/6 | 58/9 | 40/- |
| 600,000 | 10/- | Keith, Blackman ... ... ... | 22/6 | 17½ | 15 | 7 15 6 | 22/6 | 15/- | 21/9 | 15/- |
| 160,000 | 4/- | London Aluminium ... ... ... | 4/1½ —1½d. | 10 | 10 | 9 14 0 | 4/4½ | 3/- | 6/9 | 3/6 |
| 2,400,000 | 1 | London Elec. Wire & Smith's Ord. ... | 54/9 +1/- | 12½ | 12½ | 4 11 3 | 54/9 | 39/9 | 54/6 | 41/- |
| 400,000 | 1 | Ditto Pref. ... ... ... ... | 23/3 | 7½ | 7½ | 6 9 0 | 23/3 | 22/3 | 25/3 | 21/9 |
| 765,012 | 1 | McKechnie Brothers Ord. ... ... | 40/- +2/9 | 15 | 15 | 7 10 0 | 40/- | 32/- | 48/9 | 37/6 |
| 1,530,024 | 1 | Ditto A Ord. ... ... ... | 42/6 +5/- | 15 | 15 | 7 1 3 | 42/6 | 30/- | 47/6 | 36/- |
| 1,108,268 | 5/- | Manganese Bronze & Brass ... ... | 12/- —3d. | 20 | 27½‡ | 8 6 9 | 12/3 | 8/9 | 21/10½ | 7/6 |
| 50,628 | 6/- | Ditto (7½% N.C. Pref.) ... ... | 6/- | 7½ | 7½ | 7 10 0 | 6/3 | 5/9 | 6/6 | 5/- |
| 13,098,855 | Stk. (£1) | Metal Box ... ... ... ... | 59/6 +2/- | 11 | 11 | 3 14 0 | 59/6 | 41/9 | 59/- | 40/3 |
| 415,760 | Stk. (2/-) | Metal Traders ... ... ... ... | 8/9 +9d. | 50 | 50 | 11 8 6 | 8/9 | 6/3 | 8/- | 6/3 |
| 160,000 | 1 | Mint (The) Birmingham ... ... | 20/- | 10 | 10 | 10 0 0 | 22/9 | 19/- | 25/- | 21/6 |
| 80,000 | 5 | Ditto Pref. 6% ... ... ... | 79/6 | 6 | 6 | 7 11 0 | 83/6 | 79/6 | 90/6 | 83/6 |
| 3,705,670 | Stk. (£1) | Morgan Crucible A ... ... ... | 40/6 | 10 | 10 | 4 18 9 | 40/6 | 34/- | 54/- | 35/- |
| 1,000,000 | Stk. (£1) | Ditto 5½% Cum. 1st Pref. ... | 17/6 | 5½ | 5½ | 6 5 9 | 17/6 | 17/- | 19/3 | 16/- |
| 2,200,000 | Stk (£1) | Murex ... ... ... ... ... | 51/- +1/9 | 17½ | 20 | 6 17 3 | 58/9 | 47/9 | 79/9 | 57/- |
| 468,000 | 5/- | Ratcliffs (Great Bridge) ... ... | 10/6 | 10 | 10 | 4 15 3 | 10/6 | 6/10½ | 8/- | 6/10½ |
| 234,960 | 10/- | Sanderson Bros. & Newbould ... | 24/9 | 20 | 27½D | 8 1 6 | 27/- | 24/6 | 41/- | 24/9 |
| 1,365,000 | Stk. (5/-) | Serck ... ... ... ... ... | 16/- +3d. | 17½Z | 15 | 3 13 0 | 15/9 | 11/- | 18/10½ | 11/6 |
| 600,400 | Stk. (£1) | Stone (J.) & Co. (Holdings) ... ... | 69/9 +4/3 | 18 | 16 | 5 3 3 | 69/9 | 43/9 | 57/6 | 43/9 |
| 600,000 | 1 | Ditto Cum. Pref. 6½% ... ... | 23/6 | 6½ | 6½ | 5 10 9 | 24/3 | 19/6 | 21/9 | 18/9 |
| 14,494,862 | Stk. (£1) | Tube Investments Ord. ... ... | 70/- +8/3 | 17½ | 15 | 5 0 0 | 61/9 | 48/4½ | 70/9 | 50/6 |
| 41,000,000 | Stk. (£1) | Vickers ... ... ... ... | 32/9xd —4½d. | 10 | 10 | 6 2 0 | 34/- | 28/9 | 46/- | 29/- |
| 750,000 | Stk. (£1) | Ditto Pref. 5% ... ... ... | 15/- | 5 | 5 | 6 13 3 | 15/6 | 14/3 | 18/- | 14/- |
| 6,863,807 | Stk. (£1) | Ditto Pref. 5% tax free ... ... | 21/9 | *5 | *5 | 7 1 3A | 23/- | 21/3 | 24/9 | 20/7½ |
| 2,200,000 | 1 | Ward (Thos. W.), Ord. ... ... | 84/9 +1/3 | 20 | 15 | 4 14 3 | 84/9 | 70/9 | 83/- | 64/- |
| 2,666,034 | Stk. (£1) | Westinghouse Brake ... ... ... | 41/9 +1/3 | 10 | 18P | 4 15 9 | 41/9 | 32/6 | 85/- | 29/1½ |
| 225,000 | 2/- | Wolverhampton Die-Casting ... | 9/9 +3d. | 25 | 40 | 5 2 6 | 9/6 | 7/1½ | 10/1½ | 7/- |
| 591,000 | 5/- | Wolverhampton Metal ... ... | 19/9 +3d. | 27½ | 27½ | 7 1 0 | 19/9 | 14/9 | 22/3 | 14/9 |
| 78,465 | 2/6 | Wright, Bindley & Gell ... ... | 4/9 +4½d. | 20 | 17½E | 10 10 6 | 4/9 | 3/3 | 3/9 | 2/7½ |
| 124,140 | 1 | Ditto Cum. Pref. 6% ... ... | 12/9 | 6 | 6 | 9 8 3 | 12/9 | 11/3 | 12/6 | 11/3 |
| 150,000 | 1/- | Zinc Alloy Rust Proof ... ... | 2/10½ +1½d. | 27 | 40D | 9 7 9 | 3/1½ | 2/7½ | 5/- | 2/9 |

*Dividend paid free of Income Tax. †Incorporating Zinc Corpn. & Imperial Smelting. **Shares of no Par Value. ‡ and 100% Capitalized issue. • The figures given relate to the issue quoted in the third column. A Calculated on £7 14 6 gross. Y Calculated on 11½% dividend. ‖Adjusted to allow for capitalization issue. E for 15 months. P and 100% capitalized issue, also "rights" issue of 2 new shares at 35/- per share for £3 stock held. D and 50% capitalized issue. Z and 50% capitalized issue. B equivalent to 12½% on existing Ordinary Capital after 100% capitalized issue. ϕ And 100% capitalized issue. X Calculated on 17½%. C Paid out of Capital Profits.